

Special Report: The Micro's Surprising Role in Science and Engineering

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POPULAR COMPUTING[®]

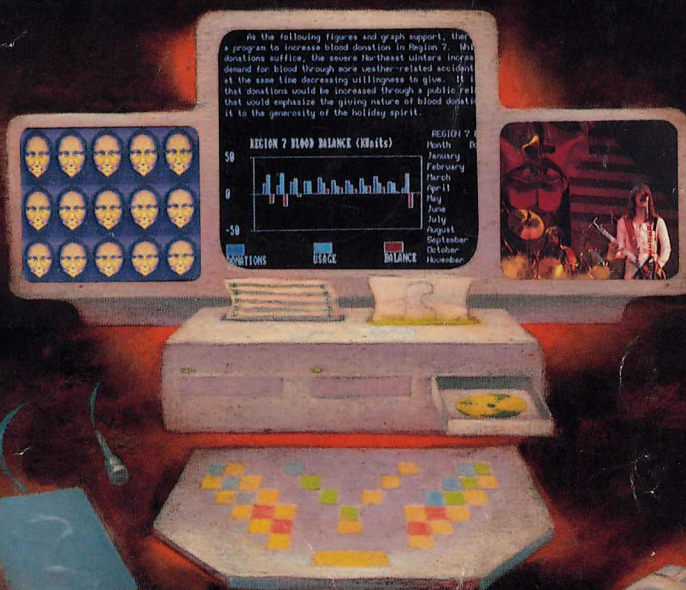
DREAM MACHINE

PREVIEWING THE ULTIMATE PERSONAL COMPUTER

**Steven Levy
Tests Software
That Solves Life's
Dilemmas**

**Confessions of a
Man Who Lives
With Movits**

**Hardware Reviews:
Commodore's
New Plus 4
Four Macintosh
Hard Disks
HP's Unix-Based
Portable**



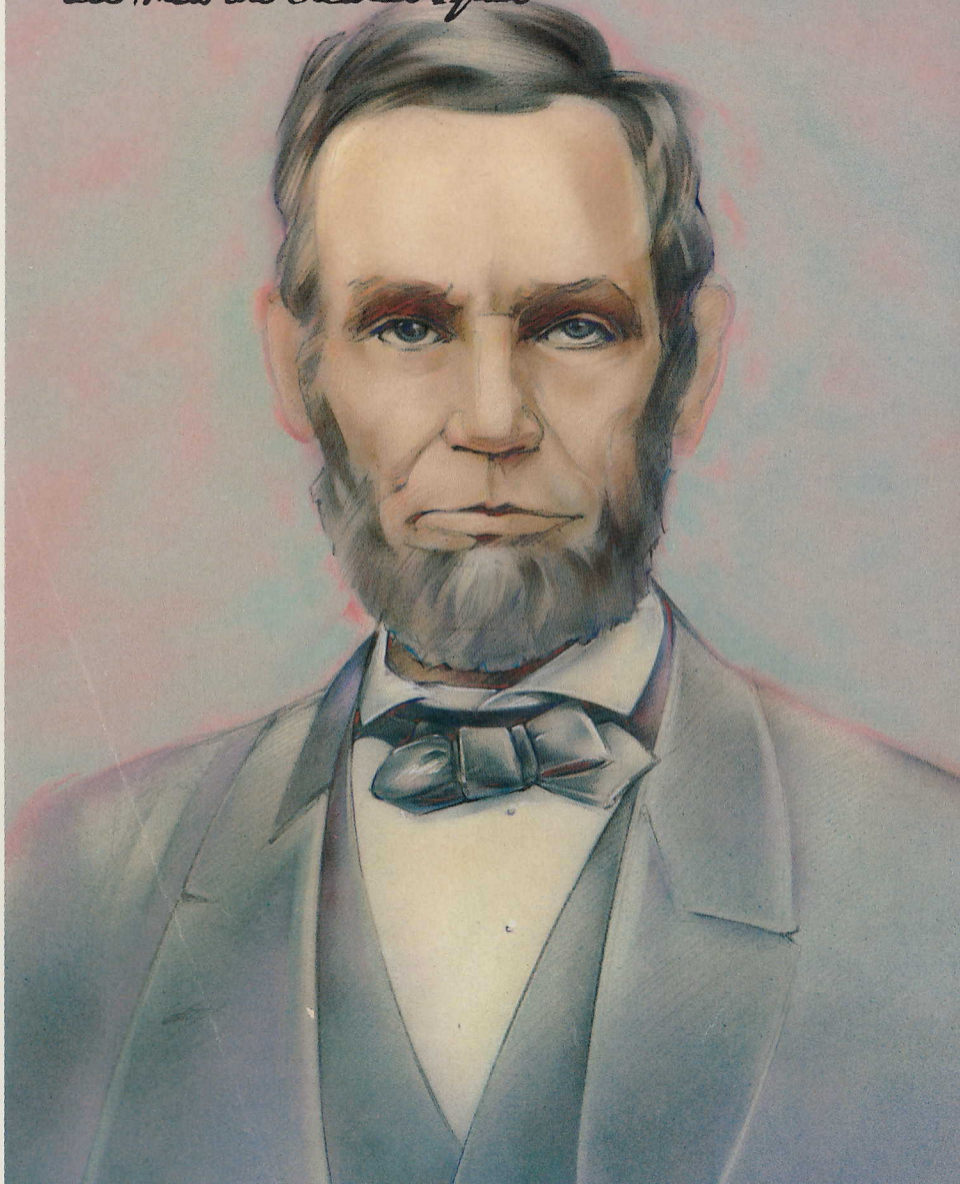
**Jerry Pournelle
Flattens the Foes
of the Micro
Revolution**

**A Painless
Introduction to
Assembly-
Language
Programming**

**Software Reviews:
Open Access
Freestyle
Please
Hypergraphics**



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So you find

"McGuire" and, along with his name, his million-unit order.

Where were you on that weird week of

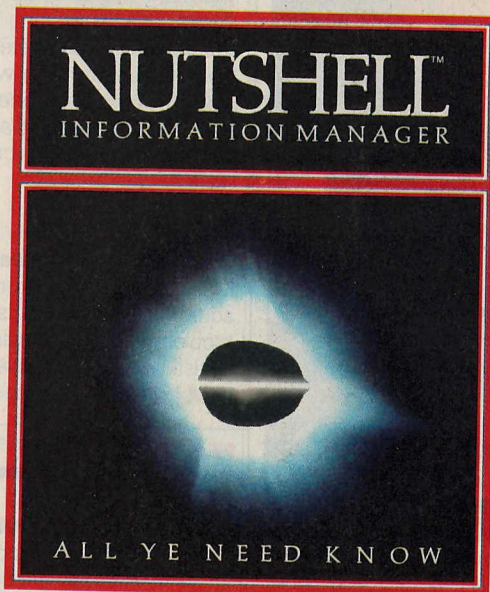
March 5, 1984 when you managed to expense \$12,648? Type in 3/5/84 (or "\$12,648" or "Polo Club"), and... here's your answer, Mr. Tax Man.

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Educational Computing by Dan Watt—A provocative new book by a sociologist/psychologist explores troubling issues that surround the relationship between people and computers.

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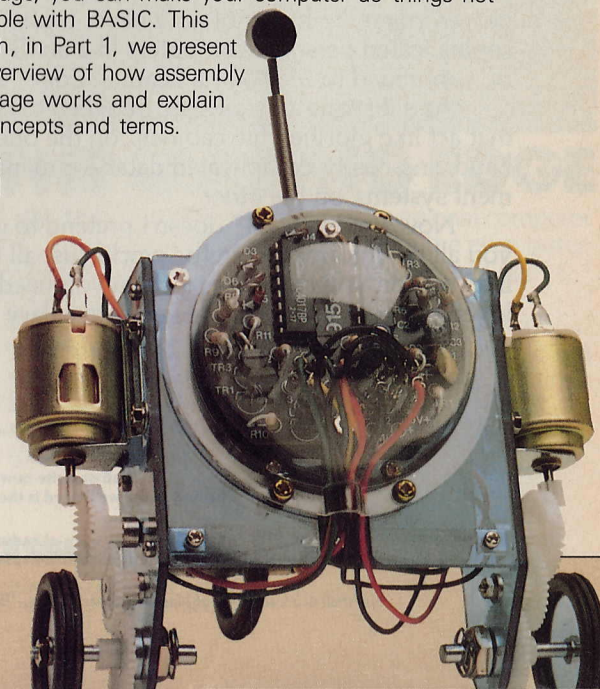
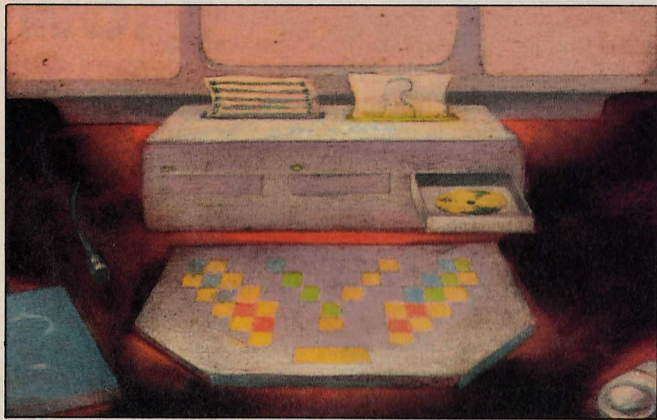
A Beginner's Guide to Assembly Language by Cy Tymony—Bypassing BASIC and working in assembly language, you can make your computer do things not possible with BASIC. This month, in Part 1, we present an overview of how assembly language works and explain its concepts and terms.

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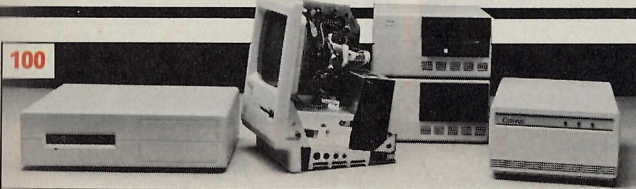
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The Dream Machine by Paul Freiberger—Before arriving at his own vision of the ultimate personal computer—with multiple screens, a large programmable keyboard, a touch pad, and a mouse—the author sought the ideas of many experts, including futurists and industry gurus.



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On the Cover: "Dream Machine," painting by Greg Spalenka. Screen image (left): computer graphic by Michael Assante/NYIT, photographed by Werner Wolf/Black Star.

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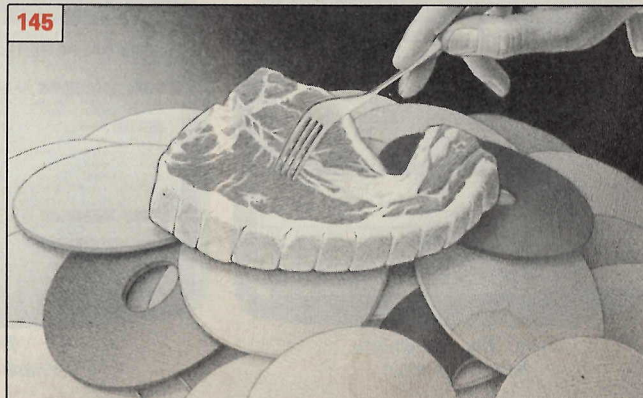
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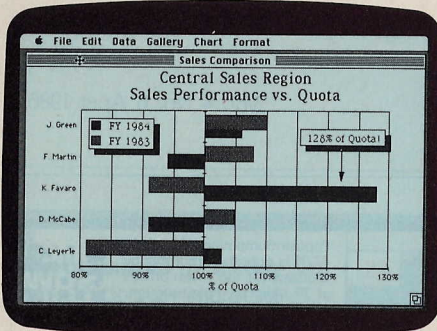
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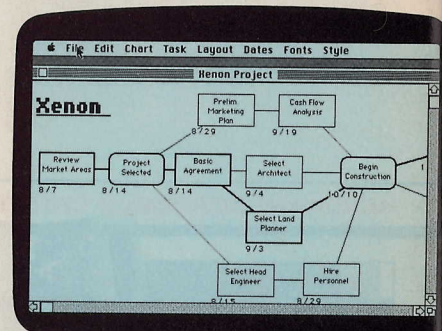


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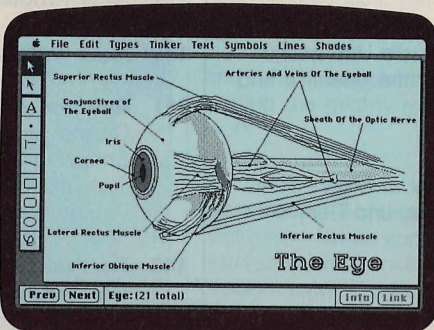
Microsoft Chart,
business graphics.

Microsoft Multiplan,
electronic spreadsheet.

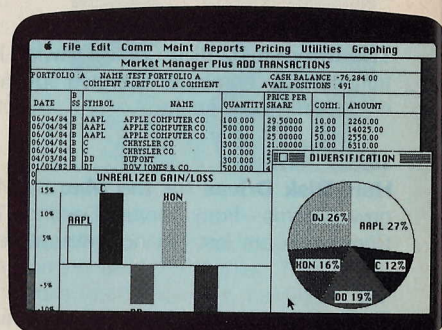


MacProject,
project management.

Dow Jones Spreadsheet Link,
stock analysis and communications.



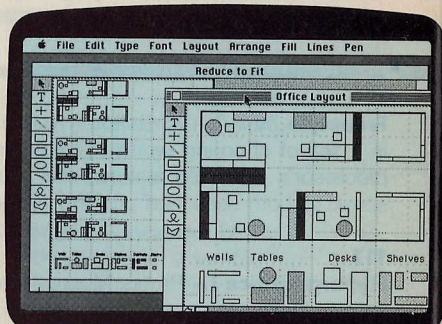
Filevision,
database management.



Dow Jones Market Manager,
stock analysis.*

MacWrite,
word processing.

theBase,
database management.



MacDraw,
graphic illustration.

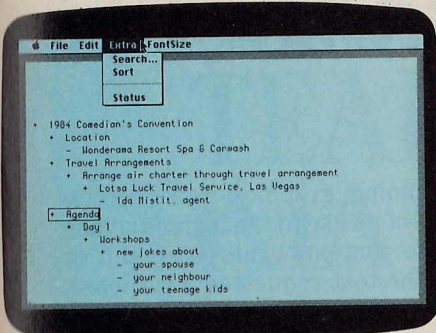
Home "Mac" Accountant,
personal finance.

TK! Solver,
equation processor.

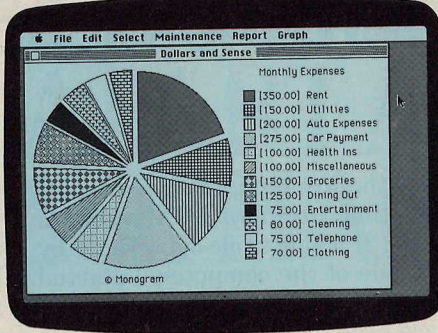
Habadex,
database and communications.

The programs above are just a few examples of new software for Macintosh. Some are available now, others will be released in the coming weeks. *Available 4th quarter, 1984. **Available 1st quarter, 1985. © 1984 Apple Computer Inc. Apple, the Apple logo, MacDraw, MacProject, MacTerminal, and MacWrite are trademarks of Apple Computer Inc. Macintosh is a trademark licensed to Apple Computer Inc. For an authorized Apple dealer nearest you call (800) 538-9666. In Canada, call (800) 268-7796 or (800) 268-7637.

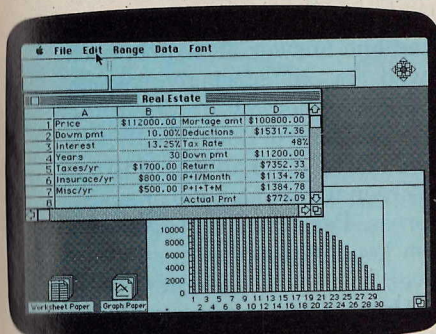
some important programs.



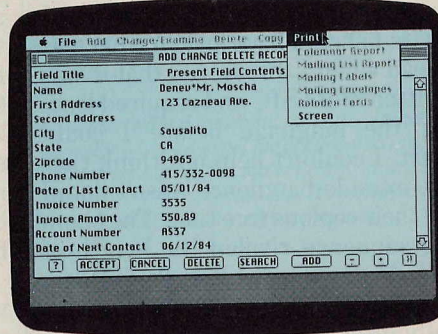
*ThinkTank,
idea processor.*



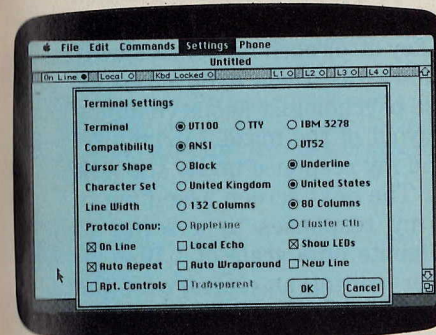
*Dollars and Sense,
personal finance.*



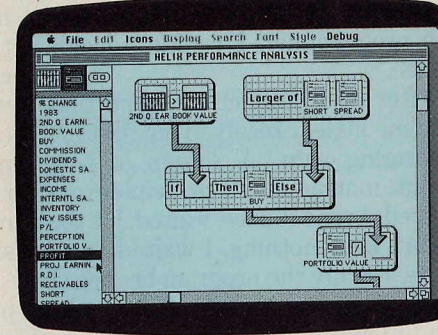
*The Lotus Macintosh Product,
integrated business software.***



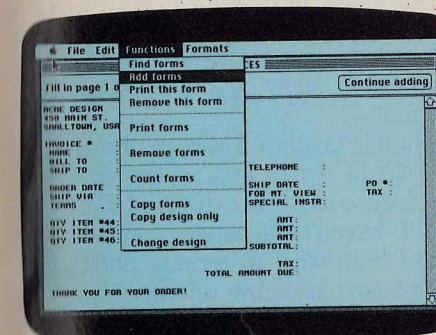
*Main Street Filer,
database management.*



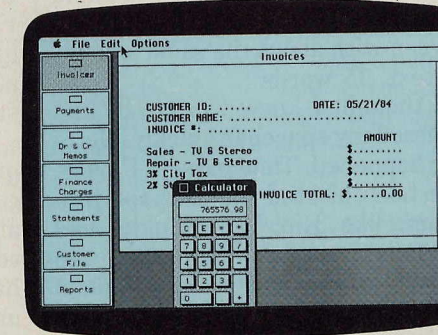
*MacTerminal,
data communications.*



*Helix,
relational database.*



*PFS: File,
database management.*



*Peachtree's Back to Basics,
accounting package.*

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POPULAR'S VIEW

Senseless Software

Over the weekend, I decided that it was time to play with software again. Stacking a pile of packages by the side of the computer, I started on the first. That experience could have been enough to turn me off to software forever.

The program promised to teach me more about managing people. I guess I should have known what was ahead when I discovered that it was written in BASIC and required loading the language before I could start. I couldn't help but think that the intended audience wasn't noted for their copious free time. The opening sequence rivaled the length of the closing credits for *Star Wars*. Pixel by pixel, the program methodically drew the company's logo, adding embellishments that served no purpose other than as a sop to someone's ego—perhaps the founder or the programmer, I couldn't decide which.

After an introductory menu that told me little, I received my first encouraging sign. A screen of text about management principles appeared. I read it once, waited, hit the return key—nothing. I waited some more. Finally the program beeped (I think the noise was intended to wake me up) and a message asked me to press the space bar when I had finished reading the text. A rapid tap of that key brought another screen with about the same amount of text, 15 words.

I thought I knew what to do and pressed my spacebar quickly. Nothing happened. Time passed. Finally, the beep alerted me that the program, like Rip Van Winkle, had awakened and was displaying the okay to press the space bar. Like a fool, I continued.

The next screen began ever so slowly to draw crude graphic icons of faces. When the text appeared, it became obvious that those time-

consuming graphics were decoration—of no use to the understanding of the content whatsoever. But at last the text requested a response; finally some interaction. I typed in my answers, one after another, culminating in a carriage return. Another beep signaled an error message explaining that the program wanted one answer at a time, each followed by a carriage return. Grumbling under my breath, I followed the instructions. With the selection complete, I advanced to the next screen without a beep or space-bar press. Perhaps I had passed a hidden keyboard agility test.

Never try to second-guess software. My next screen presented text asking for a multiple-choice response. I pressed the letter of my response and the return key. A beep startled me; the message, no need for the return key after each response, slowly crawled across the screen. Like a rat whose psychologist keeps changing the layout of the maze, I grimly repeated my response under the new rules. The next screen asked me to rate my responses to a series of statements on a scale of 1-10.

After waiting an eternity for the program to laboriously draw the scale and the labels line by line, I was ready for some rapid interaction. I should have known better. Following each response, the program redrew the entire screen instead of just showing me another statement.

Enough is enough. I was ready to quit. I could try to explain my circuitous route to do just that, but I'm afraid I haven't the space or the courage. Software programs don't have to have packaging finesse, documentation worthy of a Pulitzer prize, or Lucasfilm-style graphics to be worth using. But they should show evidence of at least a touch of common sense. —Pamela Clark

WE ASKED THE CRITICS TO TEAR APART ALPHA'S DATA BASE MANAGER II™



"DBM II offers information managers a file control system as good or better than any other on the market. The documentation with DBM II meets the high standards of all business applications packages from Alpha."



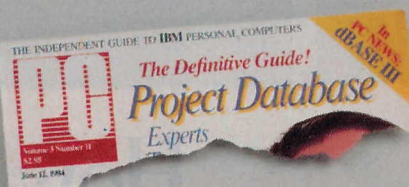
"I used DBM II for about a month. I tried everything I could to get the program to fail, without success. Alpha has evidently anticipated almost every human misuse of the system. Overall, DBM II is an exciting product."



"A product of the future is available today in DBM II. It not only gives you all the features of a typical data base management system, but it also provides you with access to files developed with other programs."



"I recommend DBM II highly. It is well debugged and easy to use. It will work with the bulk of 'other' packages today. You won't have to re-learn your favorite programs with DBM II."



"DBM II must have been developed for business people who want nothing to do with becoming computer literate, and everything to do with easily running business applications. It's so easy you can run a data base within two minutes of booting the disk."



"Sensing the frustration that grows out of having spreadsheets and word processors that don't communicate, and recognizing the need for a data management program for the business computer user, Alpha created DBM II."

We thought you'd like to see the pieces left behind after the nation's leading software critics got their hands on Data Base Manager II—The Integrator.

What they said is what thousands of happy DBM II users have been saying for a long time. It's easy to use, powerful, flexible. And unlike any other data base program you can buy, it lets you instantly integrate files from just about any word processor and spreadsheet program.

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bination of programs you like. So reports, form letters, even bookkeeping functions are a snap.

And if the critics thought DBM II was great before, wait until they see our newly updated Version 2.0. It's got all the same easy to use features, and then some.

Like simplified menus so your work goes even faster. Or the fabulous new feature called AlphaKEY™ that lets

you pre-program your own data processing routines, and repeat them with a single keystroke.

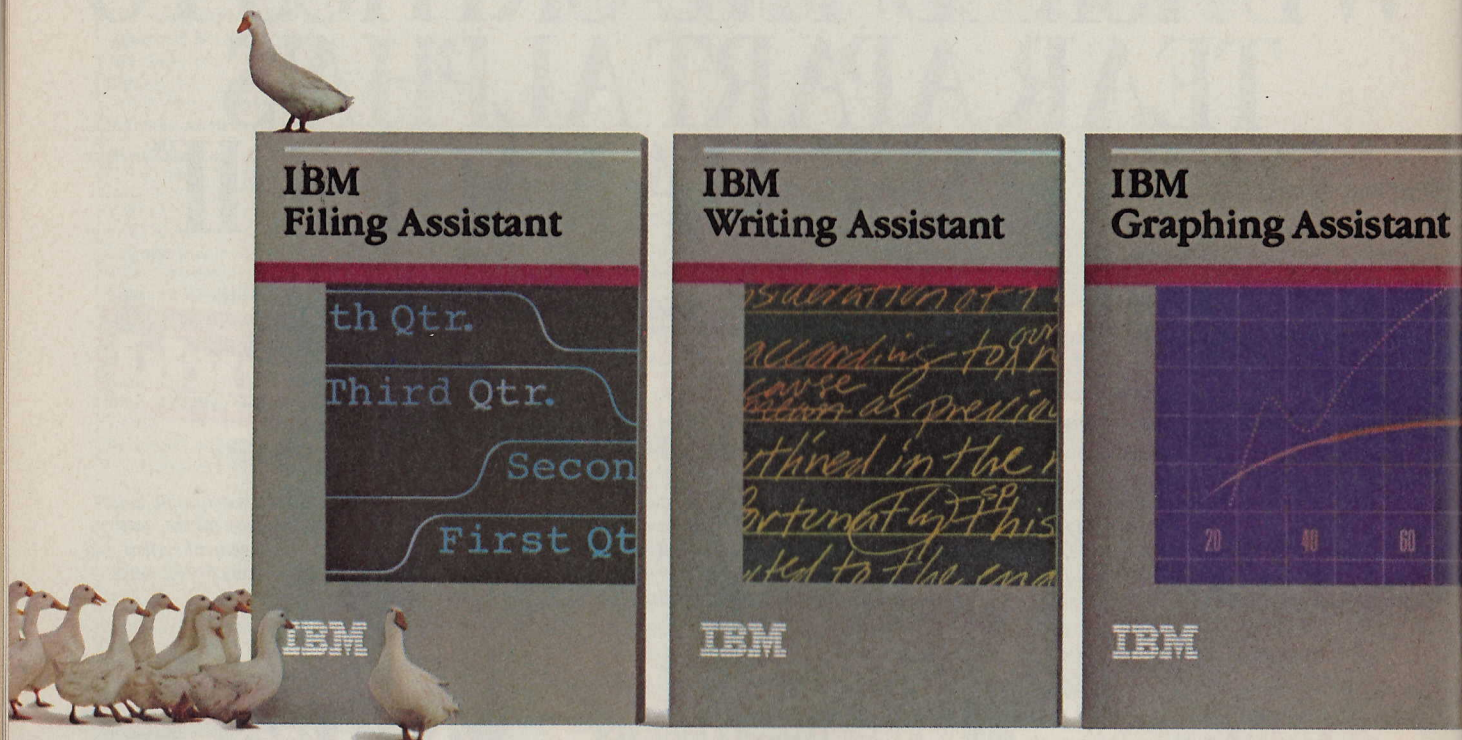
But the real test is not what we say, or what the critics say. It's what you'll say when you see it for yourself at your Alpha Software Dealer.



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Forecast	Actual
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ITEM	EST. V
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LETTERS



Antidotes for AT&T

Dear Editor:

William Penn's problem with computer communications over AT&T voice-grade phone lines (December 1984, Letters) is an old one. As a long-time computer user, I've had similar experiences with various phone companies. Here's some advice that may help.

To get his line problems solved, Mr. Penn can slow down to 300 baud, and/or he can get his phone line cleaned up. He may have to do both to achieve total success. Communicating at 300 baud can be done more reliably over poor lines than communicating at 1200 baud.

His line problems can be solved, but the repair people he's seen so far don't know how to solve them. This is very common among telephone repair people. They usually fall back on the old excuse that the customer needs to invest in special (expensive) data lines. This old story has been used and abused ever since the invention of the telephone repairman—Mr. Penn should ignore it.

To get the line improved, Mr. Penn must do two things: he must find a good repair person inside the phone company (somehow), and he must never, *never* mention that he

is using the phones for data transmission. Instead, he should complain about the static and other interference that he himself can hear when he is using the phone.

This has always been a frustrating problem, and it's getting worse with the break-up of the phone company and all the independent companies coming on the scene. The only thing harder than getting one phone company to clean up your line is to get two to work together to clean it up. Good luck, Mr. Penn.

*Peggy Burnett
President, Bulgren and
Burnett Computer
Consultants
Lawrence, KS*

Dear Editor:

In reference to William Penn's letter, I have been dealing with AT&T and data transmission over its voice circuits since the first acoustically coupled Audio Frequency Shift facsimile machines were introduced in 1967. I, too, have heard the same excuses from AT&T and its former operating subsidiaries. In all fairness to AT&T, I have also been treated with real concern and a true willingness to solve the problem. Policy seems to be left to the manager of the Toll Test Board at the local telephone exchange.

If it is necessary to "get tough" to get something done, Mr. Penn can lodge his complaint with the Federal Communications Commission, Common Carrier Division at Denver and at Houston. Usually, just mentioning to AT&T that you intend to complain to the FCC and/or the Public Utilities Commission of the state will bring any manager to a serious discussion of the problem and a quick solution to the problem.

The last resort is to do a

"Proof of Performance" test of the circuit in question using independent technicians who can certify the results of the test. This requires coordination of qualified technicians at both ends of the circuit during the test. The results of the test can be submitted to AT&T and the FCC if the parameters do not meet standards for a "voice-grade circuit."

I, for one, have found that AT&T has recurring problems maintaining voice-grade communication which affects data transmissions between the following area codes:

816 and 402
915 and 402
816 and 312
816 and 512
402 and 201
307 and 915
915 and 713
915 and 806
915 and 303
915 and 512

The above is not an all-inclusive list but the circuit paths where most of my "trouble calls" are generated from. Generally speaking, the facsimile problems are created by lower-than-specified audio level, white noise, frequency shift due to instability of the sideband reinserter oscillator, single frequency "suck-outs," and components that "ring" and produce the 2600 Hz disconnect signal. These same factors will cause all kinds of garbage in a 300-baud transmission and unintelligibility at 1200 baud in a data transmission.

In Midland, Mr. Penn has been exposed to Ma Bell's finest state-of-the-art switching and carrier equipment, i.e., the ESS-1A central office exchanges and fiber-optics cable between central offices for long-distance calls that perform as well as a call next door. If Bayfield, Colorado's telephone system is compar-

able to other areas in Colorado, Mountain Bell and AT&T are still using 1930s switching technology and early 1950s microwave carrier equipment.

There is another possibility—the "private line" may not be a private line but a time division multiplexed party line. This type of line is used where few physical lines are available and customers want a private line. Usually, the time base frequency is high enough not to create modulation products that cause garbage in the data signals. The multiplex encoder-decoder units at the customer's location are solid-state devices that have the capability of creating noise, phase shifting certain frequencies, and failing to produce a signal to ring the telephone bell.

*J. Terrence Purcell
Midland, TX*

Dear Editor:

I'm writing in response to William Y. Penn's letter. I too live in Colorado and have a business that requires data transfer over the phone lines. I also had the same problem with phone noise interfering with my data work.

I called Mountain Bell and the Colorado State University Computer Center about the problem and I got basically the same response as Mr. Penn, i.e., the phone lines were designed for voice communications, and data transmission is done at your own risk. Well, I felt that there may have been some misrepresentation of the product but persevered with my work anyway.

I found that the noise that occurred on my line seemed to be correlated with periods of high usage. My guess would be that when other people are doing a lot of talking this somehow interferes

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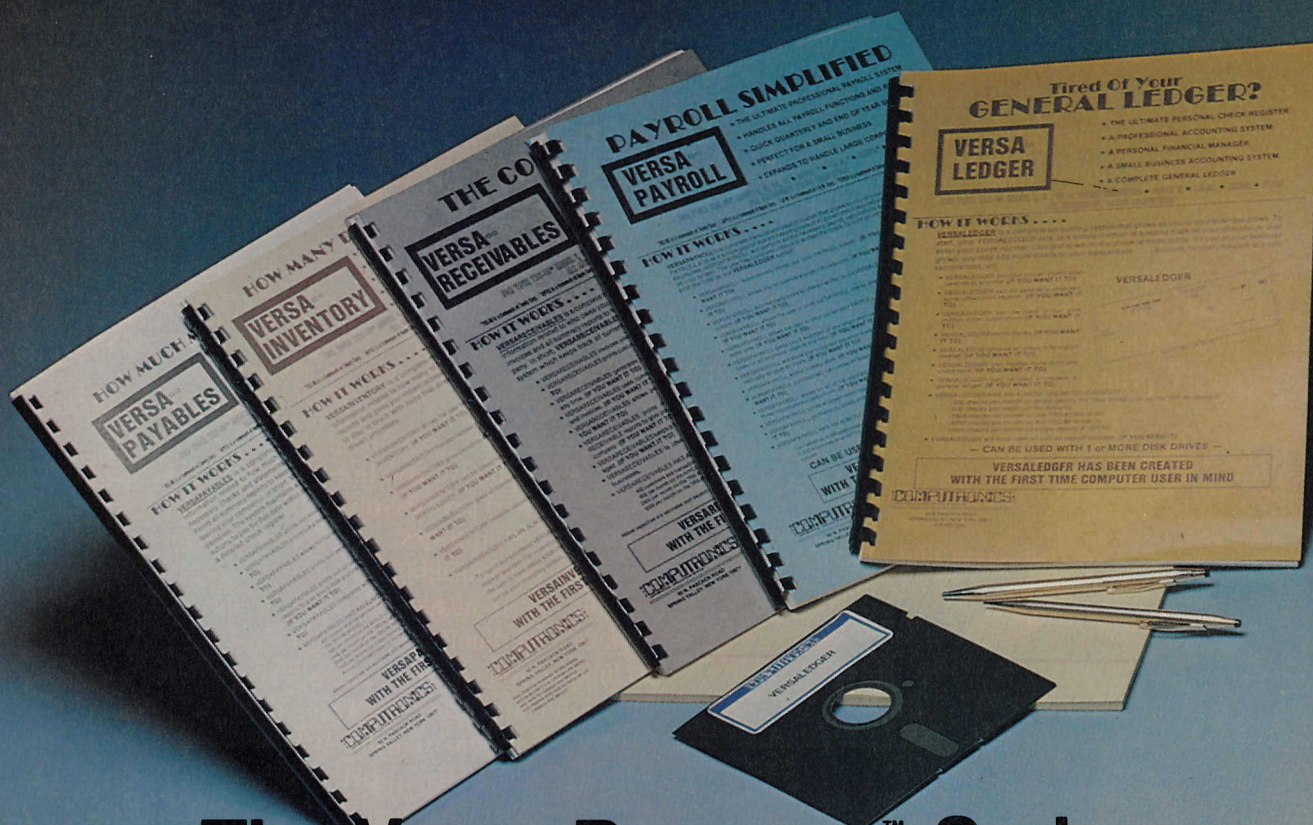
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with data transmission regardless of whether or not you have a private line. When I kept my on-line work to off hours such as early in the morning or late at night, I had very little trouble with noise interference.

*Barry F. Van Sant
Natural Resource Services
Fort Collins, CO*

Dear Editor:

As an employee of an operating telephone company and a large user of the public telephone network for data communications, I was very much interested in Mr. Penn's letter. My capacity as a Transmission Engineer has given me extensive knowledge of the technical requirements and operation of the various components of the phone network. I believe that most data communicators will agree with me that the switched network is highly reliable for data transfer using modems, especially at 1200 baud and less. However, because of the complex nature of the system, things can, and do, go wrong.

Mr. Penn stated that his phone line did have a noticeable amount of "noise" on it, but he did not explain how he knew that noise was his problem and that his equipment was functioning properly.

Let's assume that his equipment was not defective and all functions and features were proper and compatible (word length, parity, stop bits, etc.). Let's also assume that noise was his problem. Because of the tandem connecting nature of phone calls, this noise could be coming from anywhere along the line and/or be accumulated with length. At this point, another assumption is in order: that the noise on his line was indeed the culprit.

I suggest that Mr. Penn request from Mountain Bell written certification that his local phone service in Colorado meets all industry standards (loss, loop resistance, frequency response, C-message noise, impedance, etc.). Why? Because chances are very good that if the noise

levels are high enough to cause data communication problems, the noise standards have been exceeded. In my job, I have used dial-up modems made by Hayes, General Datacomm, Zoom, and Rixon, at both 300 and 1200 baud, and have found all of them to be reliable on average or better phone lines. My department makes at least 2000 long-distance data calls per year.

It is true that no phone company guarantees that normal lines will handle data. But the modem manufacturers have designed their equipment to operate reliably within the standards of voice phone lines. Even Western Electric, a subsidiary of AT&T, makes a complete line of dial-up modems.

So, Mr. Penn, insist that Mountain Bell do a complete test on your Colorado phone line. You are paying for your service and you have a right to get what you are paying for. If Bell does a good job, they will either find something wrong and fix it, or they will prove that all standards are being met.

*Duane Kinsman
Administrator-Network
Access Bureau
Contel Service Corp.
New England Division
Concord, NH*

In Defense of AT&T

Dear Editor:

It seems of late that AT&T has been taking a lot of heat for its post-breakup problems. Litton Computer Services is one AT&T customer who has not experienced these problems. In fact, we feel that the service has been so exceptional that we want you and your readers to know about it.

We at Litton Computer Services have recently moved our West Coast data center and nearly 300 employees to a new building in Woodland Hills, California. As a remote computing services firm, our business depends solely on the ability of our more than 300 customers to access our computer systems via phone

lines—many of them AT&T long lines.

AT&T delivered *ahead* of schedule and has maintained its solidly consistent support throughout the move. Because of AT&T, we were afforded the luxury of adequate time to thoroughly test our new center and shake out any problems before moving the processing load. On the day of the cutover, we came up without a flaw. The customers did not even know they were processing at an entirely different location. We are greatly indebted to AT&T for its outstanding performance.

It is so easy to criticize when someone fails a task, and easy to overlook a job well done. The job AT&T performed for us was exceptional, and it would be a gross injustice if I were not to publicly commend them.

*Jim Chalker
Director, Computer Systems
Litton Computer Services
Woodland Hills, CA*

Warped Disks

Dear Editor:

I thought that your "Warped Disk Awards" in your December 1984 issue would be addressed to steering your readers away from "lemons"; instead you chose to clown it up, as apparently did many of your respondents. Your staff must have had a ball with this project.

Some of the comments that referred to specific shortcomings of certain products or insensitive business decisions by manufacturers were well aimed. But many of the awards were "in" jokes or snide comments about obscure products. Your respondents must have a limited knowledge of the field if they can vote several items as both best and worst.

You lost any pretense of scientific or statistical accuracy when you listed five products as solid contenders in the "Most Pretentious Name" category when they received fewer than the "few"

votes of the third-place contender.

Responsible journalists would not make headlines and a color insert based on the kooky opinions of anonymous readers.

*John C. Applegate
Bound Brook, NJ*

Dear Editor:

Just a note to tell you that your "Warped Disk Awards" were *great*! Keep up the good work.

*Jim Barnes
Independence, IA*

The Real MacCreator

Dear Editor:

In A. Richard Immel's article "The Unpicked Apple" (your October 1984 Small Business Computing column) he states that after Chairman Steven Jobs was not picked to run the Lisa project at Apple Computer "a miffed Jobs regrouped and then started a project that would be all his own: a Lisa-like computer—later to be called Macintosh—that was aimed more at the consumer market."

This is not the case. Jobs did not create the Macintosh project. In fact, he actively opposed it until the crew that I put together had demonstrated its power and potential. It was not named "later." I named it "Macintosh" from the very beginning, since the apple of that name is my favorite variety. I changed the spelling of the name to avoid some trade name conflicts.

I created the Macintosh project so that Apple would have a relatively low-priced machine in the new generation of bit-mapped, high-technology computers.

*Jef Raskin
Cupertino, CA*

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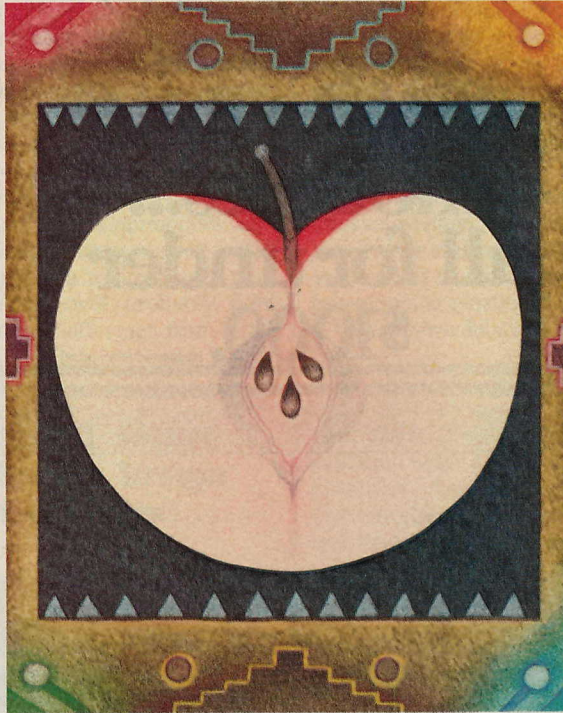
Claustrophobia is not the most common problem in the computer industry. Egotism, sure. Paranoia, perhaps. But few firms have really found themselves trapped in the middle. Apple Computer may soon be the first.

Apple is about to find itself caught between an irresistible force (the constant lowering of prices) and an immovable object (investors' constant demands for continued profits and a steady market share). It is also slipping between the proverbial rock (IBM) and a hard place (the mass market).

IBM is a tough act to follow, even for a firm that was there first. Over the past three years, Apple has watched helplessly as IBM took its place as the leading manufacturer of microcomputers.

Nowhere is IBM's dominance more apparent than in the corporate business market, where "no one ever got fired for specifying IBM." This commonly heard remark contains more truth than Burroughs, Sperry, DEC, or even Apple would care to admit. Managers and purchasing agents see IBM as the safe choice—after all, the company has been in business for many years, has developed the only recognized standards for mainframe computers and electric typewriters, and is larger and more stable than many third-world countries.

Indeed, corporate managers and purchasing agents who see IBM as rock-steady in the ever-changing landscape of microcomputer companies have a point. Too many people have bought machines that were technically better than the IBM PC but incompatible with it, and they have been unable to find the new programs they wanted or needed. In the corporate world, such a predicament is a disaster not only for the company but



Apple Gets the Squeeze

also for whoever recommended the purchase.

Owners of Apple IIs and Macintoshes have not yet faced these problems; both machines are well supported by software developers as well as by Apple itself. But the failures of the Apple III and Lisa have left corporate buyers wary.

Though Apple certainly sees IBM as a serious competitor, in IBM's eyes Apple is merely a gnat. IBM actually may be happier if Apple sticks around for the next few years. Someone has to keep trying out innovative technology. Big Blue's apparent strategy is to wait for other companies to try new ideas, see what works, and then offer its own version of the product.

Look, for example, at how IBM slipped its PC into a market pioneered by Apple, Commodore, and Radio Shack.

Over the next five years, IBM's real competitor will be AT&T, not Apple. The public may view AT&T as the phone company, but IBM sees something else. As the telecommunications and computer markets come closer together, AT&T's dominance of communications, together with the financial wherewithal that is fueling its entry into the computer market, certainly gives IBM cause for concern. This explains why IBM (through its interest in Satellite Business Systems) has entered the long-distance phone service business and why it has purchased Rolm, a large telecom-

munications firm: both moves give IBM weapons with which to attack AT&T.

As if competition from IBM for the business market weren't enough to give Apple's managers nightmares, the California company will soon face challenges from Atari and Commodore, both of whom plan to sell inexpensive Macintosh-like machines. The two machines threaten Apple's established strength in the high end of the home computer market as well as in the low-end business market.

Commodore's new machine uses the same 68000 central processor as the Mac and has a similar user interface. But Commodore's machine, developed by recently acquired Amiga Computer, offers color and better sound for what is expected to be less than half the list price of a black-and-white Macintosh. Although Commodore has traditionally targeted the home user through mass-market retailers, the firm's new machine, given the right software, could make inroads into the small-business market.

Not to be outdone, Atari (now headed by former Commodore chief Jack Tramiel), has its own Mac-like computer in its new ST machine, known in the software underground as the "Jackintosh." Atari's new computer has a 68000 processor, and it runs Digital Research's GEM environment (a Mac look-alike).

Whether Atari or Commodore can make a dent in the business computer market is not yet clear, but they're sure to offer strong competition to both Apple's Macintosh and its less expensive Apple II line in the home and educational markets.

Apple, on the defensive once again, will fight back with some technical details. For instance, the firm will note that

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since the new machines use color, they have lower resolutions. And playing its strong suit, Apple will promote the innovations embodied in its new network, laser printer, and file server (see "Apple Targets Offices with New Products," March Update).

But most of all, Apple will have to talk about software. The firm will note how much more software the Macintosh has—probably 200 to 300 business programs by the time you read this. And the Apple II line is the clear leader in educational computing, with literally thousands of programs already available.

Some software developers are sure to shy away from the new Commodore and Atari machines because they're uncertain about how well Commodore and Atari can woo the business market. In addition, customers will expect lower-priced software for the less expensive Atari and Commodore machines, thus diminishing the profit margins of the independent software vendors the two firms must rely on.

Apple can't position its Macintosh against Atari and Commodore without completely abandoning its position against IBM in the office world. Thus it's likely that Apple will combat the new Macintosh-like machines not with the Macintosh but with the venerable Apple II, perhaps in a new, vastly enhanced version. The Apple II seems almost indestructible, especially when you consider its unmatched software library. And thanks to new technology, Apple could now create a more powerful 16-bit computer that would be faster, have more memory, and run more powerful software than earlier Apple IIs while still accepting existing software.

Alternately, Apple, which

distributes primarily through computer specialty stores, could try to fight Atari and Commodore on their own turf by cutting prices on both the Macintosh and the Apple II lines and selling through the same mass merchandisers Atari and Commodore use. But the mass-market retail game is a tough one to play.

Apple will probably fight the new offerings from Atari

and Commodore, as well as the IBM PCjr, by emphasizing a version of its Apple II, always the firm's bread and butter. That leaves the Macintosh as Apple's primary weapon against IBM and other firms in the business world, and an unusual weapon it is—one targeted more at divergent thinkers than at the stereotypical executives in pinstriped suits.

When Steve Jobs and Steve

Wozniak started the company that triggered the microcomputer revolution, they envisioned supplying computers to everyone, not to a select group of trendy professionals. But in emphasizing quality over price, Apple finds itself targeting the Yuppie market of the mid-'80s. The times, as they used to say, they are changing.

—Michael J. Miller

CHART Fights Media's Image of Hackers

Ever since the early days, computer hobbyists have been known as hackers, much as amateur radio operators have been called hams. And for the most part, hackers are proud of themselves and their appellation.

In the past year, however, newspaper, radio, and television reports have indiscriminately referred to computer thieves as hackers. Making no distinction between honest, hardworking computer amateurs and unscrupulous cheats who use computers to defraud others, the news reporters have sullied the good name of many hobbyists.

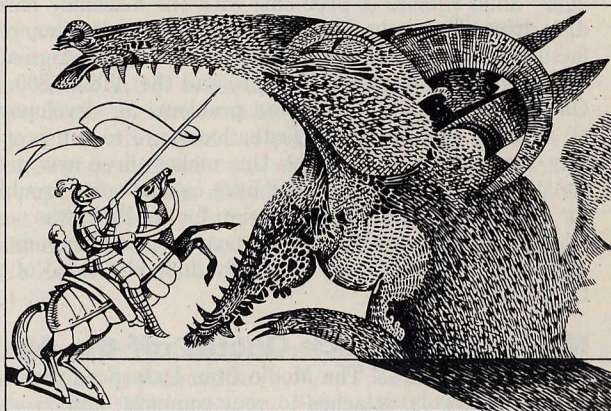
But now the technology itself is coming to the rescue. Members of Compuserve's WESIG (Writers' and Editors' Special-Interest Group) held an on-line discussion of the tarnished image of hackers, and a number of the professional writers banded together to form CHART (Computer Hobbyists Against Raiders and Thieves).

Although CHART would like to encourage the return to grace of the term hacker, the group has broader goals. By carefully monitoring legisla-

tion, CHART hopes to encourage stiff penalties for dishonest "crackers" while discouraging laws that limit legitimate computer users.

Dave Pifer, the prime mover in CHART, feels strongly that now is the time to act. "The rule book's being written as we go along," Pifer says in

cussing it on WESIG. Rarely does a slur on the good name of hackers slip by without the notice of at least one CHARTer. Even Compuserve found it was not immune to the barb of CHART's ire. An article in *Online Today*, Compuserve's Consumer Information Service in-house magazine, prompt-



reference to the legal issues of on-line communications. "It's a duty to bring ethics into the field," Pifer reports that CHART has already had some promising responses from the computer press.

CHART's on-line clubhouse keeps members instantly updated about literary injustices and inept reporting. Within a few hours of an offensive television news broadcast, CHART members will be dis-

ed comments from many CHART members.

Compuserve subscribers interested in learning more about CHART's efforts can find discussions on WESIG or leave mail for Pifer (I.D. 72255,1640). Those who don't have access to Compuserve can get more information by writing CHART, POB 97276, Pittsburgh, PA 15229.

And remember, watch what you say about hackers. □

Observations

Personal Publishing in the Offing?

After word processing, data processing, and even idea processing, is the computer world ready for a new buzzword? How about image processing (working with both text and graphics in a single unit)? Pioneers in the field are Dest Corp. with its image scanners and character-recognition controllers, Datacopy with its digitizing scanners and cameras, and Wang with its PIC graphics camera. But most of these products are priced well beyond the PC arena. Now the technology is coming down to the IBM world through products such as Concept Technologies' text/graphics publishing system, which can be used with an \$8000 laser printer. In addition, several firms now offer graphics input devices for the Macintosh, which could become part of a publishing system in conjunction with Apple's new Laserwriter printer. Soon, people may be able to use personal computers to create newsletters and other small publications—all that's needed is new software.

PC AT Causing Problems for IBM

IBM has cut back on shipments of the enhanced version of its AT, blaming "strong demand and component shortages" amid rumors of problems with the machine's hard-disk drive. The cutback should be good news for manufacturers of computers that are faster than the original PC, such as the Compaq Deskpro and the AT&T 6300. On the other hand, it may pose problems for developers of software that needs the faster hardware to run properly. An interesting sidelight: this makes three new personal computers in a row that have caused some trouble for IBM. The firm's original design for its PCjr was widely criticized for its poor keyboard (since changed), and the Portable PC was scoffingly dubbed a clone of the Compaq Portable.

Modio Takes Stock Quotes off the Air

Look, Ma—no wires! The Modio from Dataspeed (San Mateo, California) attaches to your computer and monitors stock and futures prices sent over the FM radio band. The Modio can monitor up to 250 user-selected stocks or commodities, using real-time quotes from the New York and American Stock Exchanges, NASDAQ, Chicago Board of Trade, Chicago Mercantile Exchange, and Commodities Exchange Center. In addition, the product—which is now available for the IBM PC and compatibles and will shortly be out for the Apple II family—includes software to bring the information into Lotus 1-2-3 or Symphony files.

Flat CRTs Being Developed in Japan

Tired of portable computers with liquid crystal display (LCD) screens you can hardly decipher? Read on. Sony recently showed off advances in flat-screen picture

tubes. Other Japanese firms are also working on this technology, though it's probably still several years off.

Commodore 64 Mimics Apple II

If you've outgrown the Commodore 64, Mimic Systems of Victoria, British Columbia, may have a solution for you. The firm offers Spartan, a box that plugs into the back of the Commodore 64 and lets the machine and the Commodore 1541 disk drive run software written for the Apple II and II Plus. However, the \$599 product does not provide the 80-column mode or enhanced graphics available for the Apple IIe and IIc. Whether there's a market for this remains to be seen, given ever-lower prices on Apple IIes.

Yours, Mine, and Ours

Not content with just publishing their own programs, two of the largest software companies are now promoting software developed by others. Software Publishing Corp., creator of the PFS series, is pushing accessory software through its Power Up catalog that includes products published by the firm as well as software put out by others. And Microsoft has announced a new group that will publish Macintosh software developed by other firms and distribute it to retail outlets under the MacLibrary logo.

News on the Network Front

Local networks are receiving more attention than ever. 3Com (Mountain View, California), manufacturer of EtherSeries, has introduced 3Server, a \$7500 dedicated, high-performance file server that includes 36 megabytes of hard-disk storage and can be used for sharing files and peripherals or for electronic communication. Touchstone Software (Seal Beach, California) has announced its Connectables Network for IBM PCs, Unix-based systems, and Apple's Macintosh. And Intel Corp. has introduced a single-chip local-network controller that may make for lower prices.

More Choices for Mac Owners

Macintosh owners will soon be able to choose from a variety of new peripherals. Quark, Iomega, and General Computer Company have recently introduced new hard disks for the Mac, competing against earlier offerings from Corvus, Davong, and Tecmar. Thunderware's ThunderScan fits inside an Imagewriter printer and scans images into the Macintosh, while Koala Technologies' MacVision uses a video camera to bring in images. Most of these devices use one of the Mac's two serial ports. To get more ports, you could use Microsoft's \$249 MacEnhancer, which adds one IBM-compatible parallel port and two IBM-compatible serial ports as well as drivers for several different printers.

Calendar

National Shows and Conferences

Computer Graphics '85

April 14-18, Dallas Convention Center, Dallas, TX

This sixth annual conference of the National Computer Graphics Association focuses on the latest and best technology and techniques in computer graphics. The conference includes tutorials and technical sessions in 20 application areas, as well as exhibits of equipment and displays of computer-generated graphics.

Cost: Exhibits only: \$10 in advance, \$20 on site; tutorials (half-day): \$185-355; technical sessions: \$235-\$460. National Computer Graphics Association, Suite 601, 8401 Arlington Blvd., Fairfax, VA 22031; (703) 698-9600.

6th Annual National Online Meeting

April 30-May 2, Sheraton Centre, New York, NY

Designed for information managers in libraries, law and medical offices, universities, and all areas of business and industry, this conference offers sessions on the latest advances in on-line technology, products, techniques, and services. Exhibits cover a wide range of products and services, including databases, directories, software, and information systems.

Cost: \$200-\$210 for 3 days. Learned Information Inc., 143 Old Marlton Pike, Medford, NJ 08055; (609) 654-6266.

Speech-Tech 85

April 22-24, Vista International Hotel, New York, NY

This conference focuses on recent advances in speech synthesis and voice recognition technology and applications. Conference sessions are designed for managers in business and industry, engineers, marketing and financial analysts, educators, scientists, and others who want to learn about voice input and output.

Cost: Exhibits only: \$25 per day; conference and exhibits: \$75 for 1 day, \$195 for 3 days. Media Dimensions Inc., POB 1121, Gracie Station, New York, NY 10028; (212) 772-7068 or (718) 680-6451.

Regional Shows

4th Annual New York Computer Show and Software Exposition

April 25-28, Nassau County Coliseum, Uniondale, NY

Cost: \$7. Compushows Inc., POB 3315, Annapolis, MD 21403; outside MD: (800) 368-2066; in Annapolis: (301) 263-8044; in Baltimore: (301) 269-7694; in Washington, DC: (202) 261-1047.

10th Annual Trenton Computer Festival and Flea Market

April 20-21, Trenton State College, Trenton, NJ

Cost: \$3-\$7 per day. Marilyn Hughes, Trenton State

College, Hillwood Lakes CN 550, Trenton, NJ 08625; (609) 771-2487.

4th Annual Virginia Computer Show and Software Exposition

April 25-28, Virginia Beach Pavilion, Virginia Beach, VA

Cost: Call. Compushows Inc., POB 3315, Annapolis, MD 21403; outside MD: (800) 368-2066; in Annapolis: (301) 263-8044; in Baltimore: (301) 269-7694; in Washington, DC: (202) 261-1047.

Special Interest

Computer Games: Are They Literature?

April 3-7, The Galt House, Louisville, KY

This year's annual convention of the American Popular Culture Association will address the question of whether text-adventure games such as *Deadline* and *Amazon* are the novels of the '80s.

Cost: Call. Dr. Peter Jordan, Dept. of English, College of Arts and Sciences, Tennessee State University—Downtown, 10th and Charlotte, Nashville, TN 37023; (615) 251-1570.

2nd Annual Physicians and Computers Conference

April 19-21, Las Vegas Hilton Hotel, Las Vegas, NV

The theme of this conference is Applications in Patient Care. Topics include evaluating, comparing, and implementing office systems; evaluating medical software; accessing medical information; improving communication among professionals; and aiding clinical decisions.

Cost: \$275. Beverly Johnson, University of Southern California School of Medicine, Postgraduate Division, 2025 Zonal Ave. KAM 318, Los Angeles, CA 90033; (213) 224-7051.

Classes and Seminars

Computers in Education

Educational Testing Service, Princeton, NJ 08541; (609) 921-9000

Classes include Implementing Microcomputer Programs, Designing and Implementing Computer Literacy Programs, Selecting and Evaluating Instructional Courseware, and Administrative Applications of Microcomputers. An educational technology laboratory and software center are also available to educators.

Integrated Software for the IBM PC

Software Institute of America, 8 Windsor St., Andover, MA 01810; (617) 470-3880

This class describes the concepts and benefits of software integration, identifies its functions, and provides guidelines for selecting and evaluating the appropriate packages for your applications.

The United States is in danger of losing its pre-eminent position in computer music research. This was clearly demonstrated last October, when over 500 inventors, researchers, and musicians from around the world gathered in Paris for the 10th Annual International Computer Music Conference. Institutes and studios throughout Europe are taking steps that could eventually help turn your personal computer into a virtual home orchestra.

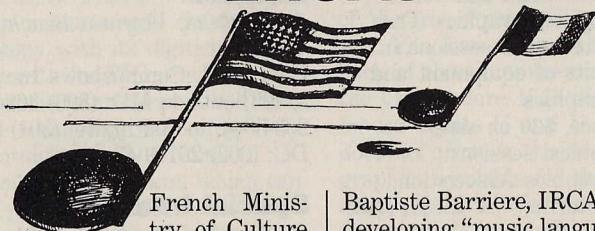
One of the first steps has been to establish a standard interface for synthesizers and personal computers. Developed in 1983 by a consortium of manufacturers of digital synthesizers, the MIDI (Musical Instrument Digital Interchange) plug is a five-pin connector that runs from, for example, a Yamaha DX-7 to a port on a MIDI card inside an Apple IIe. As many speakers at the conference said, a standard, any standard, was needed and is welcome.

Host for the conference was IRCAM (a French acronym that translates as Institute for Research in Acoustics and Music), known as the IBM of the computer music world. "IRCAM's focus is on 'art' music, and we're interested in developing tools and systems for serious composers," says director David Wessel.

IRCAM was founded in the 1960s by Pierre Boulez, the noted French composer who conducted the New York Philharmonic in the late '70s. Much of IRCAM's hardware design and software was imported from Stanford and the University of California at San Diego's Computer Audio Research Laboratory, and many Americans hold high positions in the institute.

Affiliated with the Pompidou Center in downtown Paris and amply funded by the

European Computer Music Research Challenges American Efforts



French Ministry of Culture as well as private sources, IRCAM does not suffer the vagaries of academic budget fights or politics, as is often the case with American studios. IRCAM's charter is to establish French leadership in the field of computer music, and it just might succeed. It's already one of the leading research organizations in computers and music, with a staff of 55, lavish facilities, and an impressive array of equipment.

If IRCAM does become a leader, it will be with an eye to the large potential market in the United States. Wessel proudly points out that "we are official Apple Macintosh software developers. We'll be linking six Fat Macs to a VAX 11/750 that is arriving soon."

While Wessel did not divulge the nature of the project, he hinted that it may be a scaled-down version of the powerful 4X Signal Processor developed by IRCAM. The 4X converts digital information into electrical impulses that can be played on a traditional audio system. Wessel says a third-party firm will sell the 4X, but it will be expensive. A Macintosh product, however, could have considerable impact on the home computer market.

Under the direction of Jean-

Baptiste Barriere, IRCAM is developing "music language" software that could also be aimed at the Apple Macintosh. On our visit to IRCAM we heard a stunning rendition of an aria from *The Magic Flute*. A new LISP-like language called CHANT was used to create the voice synthesis. Xavier Rodet, who originated the language, says that getting CHANT to work on a Macintosh will be easier than teaching musicians how to use it.

In addition to IRCAM, two other music research institutes are prominent in Paris: the Musical Research Group (GRM) at Radio France and the Center for Study of Mathematics and Automated Music (CEMAMu).

GRM researcher/composer Jean-François Allouis is developing a real-time system (the acronym in French is SYTER) that turns a monitor into a representation of the dials and switches on an analog synthesizer. You "play" the screen as you would the instrument bank on a synthesizer, using the mouse instead of your hands to instantly change values of different settings and reprogram the synthesizer on the fly.

CEMAMu's centerpiece is UPIC (the Center's Polylogical Information-processing Unit), an 8086-based system

that employs a Tektronix graphics tablet for inputting musical data. You plot lines on the tablet to select various voicings, timbres, and tempos.

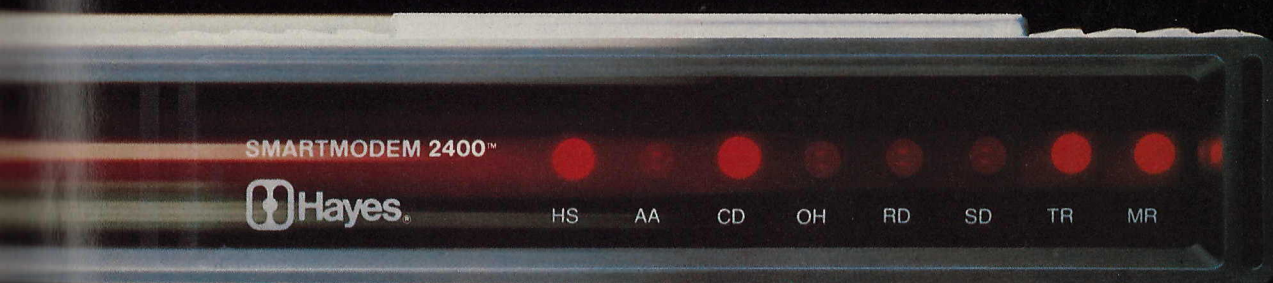
In Italy, Padua's Center for Computer Sonology (CSC) has done extensive work in developing voice-synthesis software and does hardware research as well. Founded by Professor G. Tisato and American composer James Dashow, CSC is under contract with a company in Milan to develop a chip for a synthesizer that will compete with Yamaha's DX-7.

And in the Netherlands, the Computer Music Studio at the Royal Dutch Conservatory at The Hague has a PDP-11/34 and DMX-1000 dedicated to music. Paul Berg, Professor of Sound Engineering, another expatriate American composer with a flair for programming, has developed software for these machines. He has also developed, for personal computers, a wide range of software in Pascal (running under MS-DOS) for sound synthesis, compositional algorithm processing, and music printing. "It's really for my own use," he says. "I haven't thought of marketing any of these programs."

The implications of these European advances are commercial as well as artistic. The salient feature of much of the current computer music activity in Europe is the heavy involvement of Americans, but unlike institutions in France, our music research laboratories and institutes are largely university-affiliated and often regarded as afterthoughts. In an era when the National Endowment for the Humanities spends less than the Pentagon does on military bands, how much longer can American preeminence last?

—Joseph Mancini
and Paul Freiburger

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CP/M-80: Alive and Well

When I crossed the Rubicon into Silicon Valley a few years ago, I bought an 8-bit Televideo system that happened to be on sale because the dealer was clearing the decks for 16-bit MS-DOS machines. I had divined (correctly, it turned out) that an 8-bit computer was all that a professional writer would ever need, and Televideo's big screen and comfortable keyboard suited me perfectly. I had also read wonderful things about the operating system called CP/M-80.

For you newcomers out there, the first version of CP/M-80 (or just plain CP/M) was developed by Gary Kildall in 1975 as the world's premier "Control Program for Microcomputers." Kildall formed Digital Research Inc. to market CP/M, hoping to make it the universal operating system for all 8-bit machines using 8080 or Z80 chips. He nearly accomplished that goal, except for some competition from specialized companies such as Tandy.

As a raw recruit to the microcomputer revolution, I believed that CP/M-80 would be the ideal operating system for me. But my blind faith in CP/M was shaken less than a month later when I struck up a conversation with a total stranger whom I bumped into at the Z80 shelf in the computer section of a bookstore.

"You *still* use CP/M?" this fiery proselytizer exclaimed when he learned of my choice. In his view, CP/M and 8-bit machines were clumsy antiques from the pioneer days of microcomputing.

Needless to say, I was taken aback. Had I spent a lot of money foolishly? Was my new machine so outdated that no

publisher would accept my manuscripts on disk? As a sometime scientist, I decided to study the question thoroughly. I would prove that CP/M was a wise purchase.

Well, the verdict is in: CP/M-80 is alive and well and will continue to have many advantages for single-user systems. Vindicated, I can now debunk several myths about CP/M and 8-bit computers, myths that can only have been perpetuated by sellers of 16-bit systems.

● **Myth #1: CP/M is difficult to learn and hard to use.**

This rumor was probably started by someone who tried to read Digital Research's original CP/M guides. Today, though, you can find excellent CP/M manuals written for all

isn't a major problem.

● **Myth #2: There's a shortage of good CP/M software.**

It's true that most new software today is for 16-bit systems, but so much commercial and public-domain software for CP/M-80 is available that you'll usually find exactly what you need. Many assembly-language programmers prefer to work with CP/M and then use cross-assemblers to translate their programs to other operating systems. Improvements to CP/M continue, but at a slower pace because no one needs to keep reinventing good wheels.

● **Myth #3: CP/M is inferior because 16-bit machines are faster and better than 8-bit computers.**

"Better" is a relative term. The advantages of 16-bit

as well as more expensive IBM compatibles and are even *faster* for many operations. Try comparing the 8-bit CP/M version of Wordstar with the 16-bit MS-DOS version and you'll see why I still recommend 8-bit CP/M systems to professional writers.

● **Myth #4: CP/M-80's compatibility standard will be completely gone in the near future because everyone is going to 16-bit machines.**

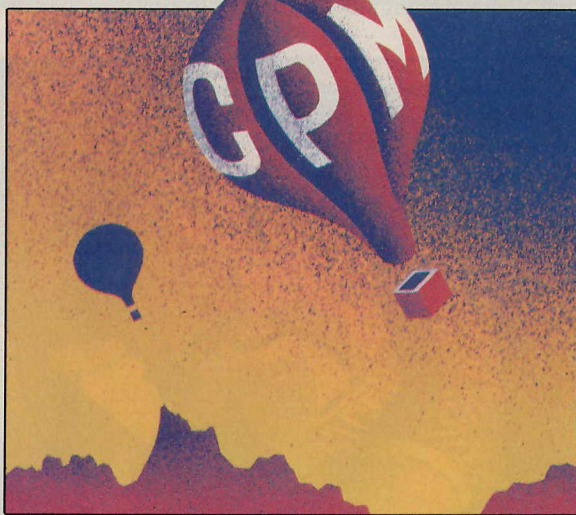
This was my biggest worry about CP/M. In these days of computerized publishing, editors like to have long manuscripts on disk so they can copy, proofread, edit, and print without the tedious and costly job of retyping. If 16-bit MS-DOS systems become the new standard in the publishing industry, will manuscripts on "antique" CP/M disks be useless?

No problem! A number of utility programs are available that enable CP/M users to translate their files into MS-DOS formats. Writers can use one of these programs to create disk-based manuscripts specifically formatted for almost any computer.

Competition is fierce in the microcomputer industry. New developments occur at blinding speeds, and operating systems are already more numerous than chips. Is CP/M hopelessly obsolete? Should we donate our CP/M-80 systems to a worthy charity and upgrade to a 16-bit system? Perhaps—but only when we need its advantages.

Can modern professional writers and other individual users with more modest requirements ride the computer expressway on the CP/M 8-bit bus? You bet we can, and in perfect comfort too. "Why buy a Mack truck," says the Chevy ad, "when a little Luv will do?"

—Morris Simon



levels of experience. In fact, I think that MS-DOS commands are more difficult for typical users to learn because they include multiuser and hard-disk functions. Some CP/M commands (such as PIP to copy files) seem backward at first in that you put destinations before sources, but this

machines lie mostly in extra memory for graphics, long number sequences, text documents, and multiple-user networking operations. Single users (including many small businesses) who don't require huge amounts of RAM or lots of pretty pictures will find that 8-bit machines do their work

Consulting anthropologist Morris Simon is also a writer of science fiction, fantasy, and technical articles.

Decisions, Decisions

A new breed of software to help you deal with dilemmas

by Steven Levy

John Couch is an affable man with a neatly trimmed moustache, a former Apple Computer executive who left the company with enough stock options to make your average lottery winner look like a pauper. His final management task at Apple was heading the Lisa project, an epicenter of high-tech thrills and spills.

It was a foregone conclusion that he would not sit still for a placid retirement as a 37-year-old Silicon Valley gentryman. But after all that action, what kind of job would satisfy him? Each company wooing him had a detailed set of persuasions and a hatful of perks. Though John Couch could obviously write his own ticket, his was no easy dilemma—he had to make a decision that would have considerable impact on his life.

There was no guidebook to tell him what to do, and if things went wrong he had no one to blame but himself. Various goodies offered by one company, or promised by another, piled up crazily, literally hundreds of factors knocking against each other with inconclusive force. "I had stack overflow," John

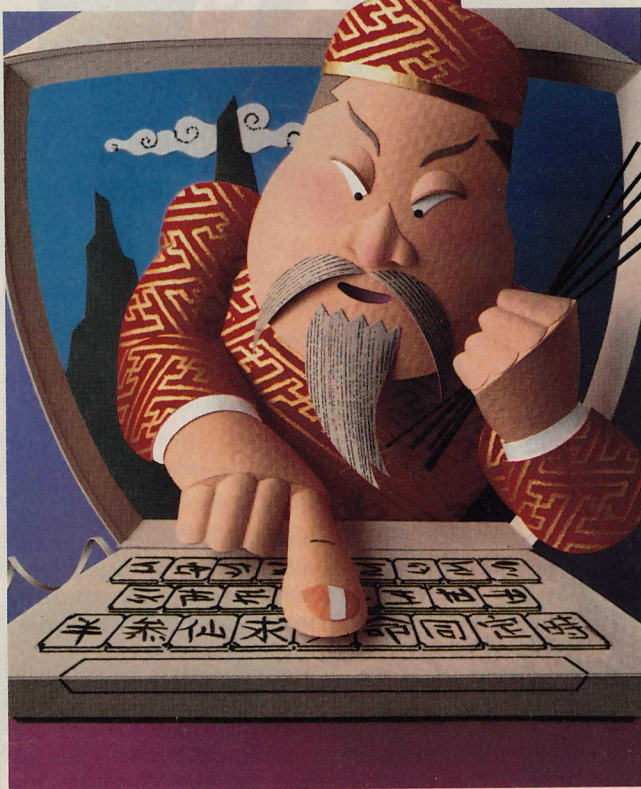
Couch recalls, significantly likening himself to a computer overwhelmed by voluminous data.

It was the kind of abyss we all stare into at one time or another. Eventually, of course, we swallow hard and make some decision, all too often letting some random element become the decisive one. If it works out, we can afford to modestly shrug and tell people how we played a hunch or discerned some sort of cryptic signal in a Chinese fortune

cookie. But when things turn out dismally, that's not good enough. The problem then is not only explaining to others how we blew it, but explaining things to ourselves—and then trying to figure out how to make a sounder choice the next time around.

Until recently, this tricky process of decision making was one we never would have expected to be solved by microcomputers. Sure, our computers might give us certain data to aid our decisions—a spreadsheet or a chart might clarify some figures—but there was no category of software actually *dedicated* to the process of making up one's mind.

As it turns out, this seemingly logical gap in computerdom was seen by some as a marketing opportunity. The world was glutted with spreadsheets, word processors, databases, and adventure games. If you wanted to experience the mutant-like growth that made software entrepreneurs the coverboys of *Inc* magazine, you would have to invent a new genre of software whether the world needed it or not. If you got in first, you would have to lay claim to "The Visicalc of" award. (Visicalc, of course,



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was the pioneering spreadsheet, and had it survived more handily, it might have been as generic a word as Xerox.) Thus the Living Videotext company wrote Think Tank, and everybody called it "The Visicalc of outline processors."

Terry Garnett understood this. While John Couch was leaving Apple, Garnett, a bright man in his mid-twenties who resembles Eddie Haskell but projects the sincerity and self-confidence of a Dale Carnegie instructor, was a rising executive at Tandem Computer Corp. Garnett could not help but notice the way people made hard choices at Tandem. "People would make decisions and have a hard time justifying them. There were political elements. There was a lot of dependence on numbers, but when it came down to it, the key was the intangibles."

Garnett was not the first student of human nature to make this observation. But as a budding Silicon Valley entrepreneur, he figured that for the first time there could be a solution to this age-old problem. Like many Silicon Valley solutions, it runs on IBM PCs and compatibles.

Garnett thus founded Lightyear, a "decision-technology company," and set some programmers to work on creating what he hoped would be The Visicalc of decision-making software. His top choice for the CEO of this dynamic firm was John Couch, whom, you will recall, we last left with all his registers full, and probably in need of a warm boot.

But now, Couch had a tool to help him make his choice—the prototype Lightyear program. He sat down with it and began to work.

Lightyear Sweepstakes

The Lightyear program is designed to help you make decisions by considering the different choices and calculating which is best—ultimately you wind up with a chart telling you which choices don't meet your standards and, of the ones that do, which ranks tops.

Steven Levy is a contributing editor of *Popular Computing*.

First you list all the alternative decisions you are considering (it does not devise ideas of its own). Then you assign the criteria for making the decision and give those criteria weights according to how important you consider them. You rate each alternative according to the criteria, and Lightyear totals up all these factors and tells you, in theory, the decision you would make if you logically calculated the things you already knew.

So John Couch listed the various factors involved in a job and weighted them on a scale where 100 is paramount and 0 is negligible. The "Chemistry" between him and his colleagues got a 100, and the "Excitement" the job provided got a 90. Since Couch had already made his fortune, "Salary" was weighted at only 50 and "Risk" a mere 40. ("Equity," on the other hand, was weighted at 60.) The "Time" of day he would be required to show up for work got a 50 weight because it was his domestic task to drive his daughter to the ice skating rink, and it would be a hardship of sorts to forego this daily pleasure.

John Couch rated each company on these and other criteria, finishing with a panoply of comparative charts, including a "Summary Evaluation" where one company came out on top. Guess what company won this little sweepstakes.

You're the Expert

Now, John Couch is not saying that he relied solely on that piece of software (undebugged yet!) to make his next career step. But he is a believer in Lightyear, as much a believer as is Terry Garnett, as I found when I met them.

I had expected some hokum, as is the case with much of the software that promises to deliver the big-computer power of "expert systems" on a micro. But, as both men emphasize, Lightyear does not claim to be an "expert system" where the decision-making assumptions and criteria are made for you.

"The user is the expert," insists Garnett, able to weight factors ac-

cording to his or her expertise. With its ability to assign values not only to numerical factors but to so-called "intangibles" (you want to figure in emotion? OK, put emotion on a scale of 1 to 10), Lightyear says its range is infinite, even able to handle the kinds of "gut decisions" that so many of us insist upon. Lightyear merely processes all the factors and comes up with comparisons in a form that, in theory, allows someone to make an informed choice.

But is that the way the world really works? Can we expect people to feed these factors and weights and criteria into a computer, press a key, and get "the answer"? Who would *want* to make a decision that way? Isn't it kind of wimpy to let your computer make decisions for you?

Fudge Factors

Not to worry. It turns out that not even Lightyear is trying to sell us on the idea that "decision-making" software should be used as the deciding factor in making a choice. After talking to the two Lightyear executives, I found it clear that the real benefit of "The Visicalc of" decision-making software is not so much in choosing, but *justifying* decisions. Apparently, a popular use of Lightyear will be to provide hard evidence for choosing the alternative the user wanted to make in the first place.

If your impulse is to award a contract to Acmetronics Cement Co., you can use Lightyear to generate a stack of charts showing how great Acmetronics is. If Acmetronics is the oldest of the companies considered, weighting the factors to favor the "years of service" category will land that firm on top. If Acmetronics is the youngest company, you can make "newness" your criterion and still have Acmetronics rate tops in a category. In other words, if you thought that a clever numbers-wizard could pull off tricks by hiding assumptions in spreadsheet formulas, wait till you see the shenanigans people pull with Lightyear.

For this purpose, the standout feature of Lightyear—though some

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might call it a fudge factor—is its flexibility. When the Lightyear user gets through with all his alternatives and weights and criteria and even a set of “rules” whereby he sets up a lot of pass-fail requirements (like “If the salary in the job is less than \$100,000, the excitement has to be scintillating”), the final standings are not cast in iron. They can be dealt with as summarily as misspellings in a word-processing document.

For instance, if you use Lightyear to decide what company your firm will try to acquire in a hostile takeover, and the “winning” company isn’t the one you secretly covet, you need not even save that model on a disk before you begin fiddling with the various criteria. Maybe you shouldn’t have given “Location” such a strong weight—so with a few keystrokes, you make it a less crucial factor.

Playing with the weights, dropping a criterion or two, or even making a rule that would eliminate a contending alternative, you eventually not only have your choice, but the choice will be *documented*. If things go terribly wrong and that choice turns out to be a disaster, you could always pull out the printout and say, “Hell, it’s not my fault, I ran it through the computer!”

Testing Lightyear

The true test of any software genre, though, comes in its use. So I anxiously awaited getting my hands on this \$495 product. Lately, I had been plagued with an excruciating decision-making process myself. It was every bit as befuddling as John Couch’s. The problem was that I wanted to get going on a new book but could not settle on a topic. Could Lightyear help me?

One thing Lightyear *can* do, and it is no small virtue, is get itself up and running with a minimum of hassle. Whatever else you can say about the program, it does an exemplary job of allowing even a novice to grasp its concepts so that by the time a single, clearly delineated tutorial is completed, that novice is ready to use Lightyear right away. So I had no problem at all setting out the various book topics that had been suggested to me by editors, friends, and my own conjectures.

I sadly noted as I entered them into my Lightyear “model” that none of these topics had set my soul afire. There were two would-be biographies, one of a modern poet I greatly admire, another of a highly controversial public figure of today. There was a potential book concerning yet another computer topic. Another topic dealt with nightclub singers—a secret passion of mine. There was a topic of an investigative nature about a nuclear accident in Mexico. And finally, a topic related to undersea exploration.

Then I set about figuring what criteria counted in my choice. “Money,” of course, but that was not the primary consideration. I rated several criteria higher, like my “In-

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terest" level in the topic and the degree of "Creativity" I could bring to the book. Less important but still factors were the "Time" it would take to finish the book and the potential "Competition" I'd have.

After all my criteria were listed—though I suspected I would need a lot more than 256K of memory to figure out every little factor that leads a person to choose a book topic—I tried to rate each alternative by those criteria.

"Money" was easy. I just estimated, probably with great inaccuracy, how much a book on each topic might make. So was "Creativity." Using a line graph all I had to do was place an "x" on a continuum ranging from creative challenge (Nightclub Singers rated highest) to the formulaic approach I'd have to take if I did Nuclear Accident.

For the Interest criterion, I used Lightyear's "verbal scale," assigning values to words. If I considered a topic "fascinating," I gave it 80 points, while if I were merely "interested," I assigned 40 points for that criterion. Other descriptive words filled out the scale.

Then I added some rules. If "Money" was less than a certain amount, the book should not take longer than a year to do. Rule Two: If the "Interest" was less than "intriguing," "Money" should be astronomical.

As I typed in this rather meretricious rule, I realized that a problem with Lightyear is that even your darkest decision-making processes have to be ruthlessly delineated if you want a fair evaluation of your alternatives. I suspect some people will balk at this. If some nasty person, for instance, used race as a reason not to hire someone, he or she would surely not be so foolish as to write this as a rule within a Lightyear model.

Finally, I had everything entered, and I ran the evaluation. Within seconds the screen displayed in full color a horizontal bar chart. From top to bottom, there were my choices. The book on the controversial public figure—the one with

moderate interest and lots of potential monies—came out on top. Meanwhile, a topic I cared more about, the one involving the poet, was highlighted in red, indicating that it had been eliminated by failing the "low money/long time" rule.

Fiddling with the Data

I found it instructive that my first instinct was not to call my editor and tell him that I was ready to get go-

ing on the topic that rated highest, but instead to fiddle with the data so I could make it come out differently. I added a *new* criterion, called "Ease of Research," to reflect a few particular problems that our top-rated topic would present. (This notoriously contentious figure would possibly hound me throughout the process and might well haul me into court before I wrote a word.)

After I finished rating the alter-

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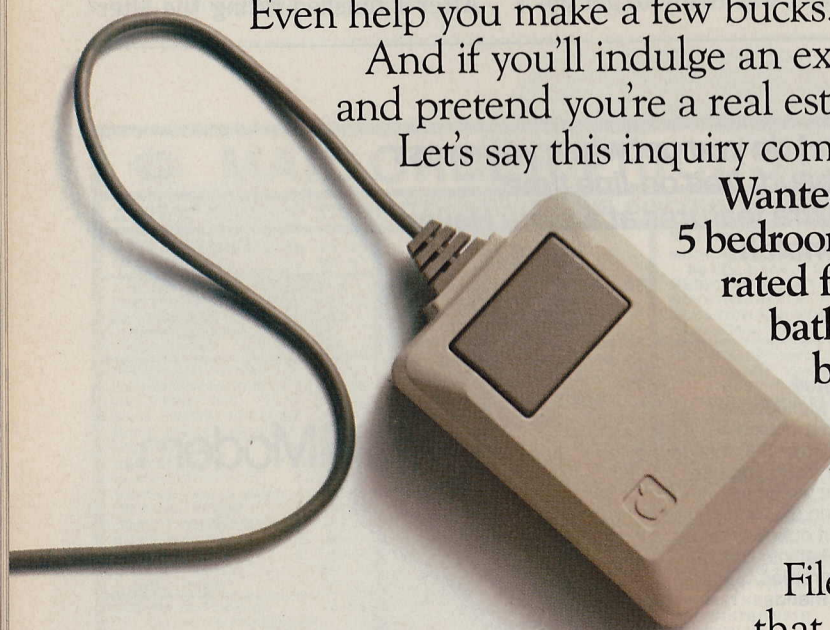
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	Location	Asking Price	Style	# Bedrooms	# Baths
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646	Kirkland	\$235,750.00	Queen Anne	3	2
647	Everett	\$187,500.00	Victorian	2	2
648	Redmond	\$284,350.00	Early American	4	3 1/2
649	Edmo			4	4
650	Capit			3	3
651	North			1 1/2	1 1/2
652	Madis	\$500,000	Tudor Bauhaus	>4	5
653	Highl			2	2
654	Queen			2	2
655	Rever			2	2
656	Madison Park	\$495,000.00	Tudor Bauhaus	5	4
657	University	\$192,750.00	Modern	4	3 1/2
658	Jamestown	\$255,000.00	Tudor Classic	5	4
659	Everett	\$203,500.00	Ranch	6	3
660	Kirkland	\$198,500.00	Early American	4	2
661	Edmonds	\$305,000.00	Gothic	5	4

File lets you search your records easily.

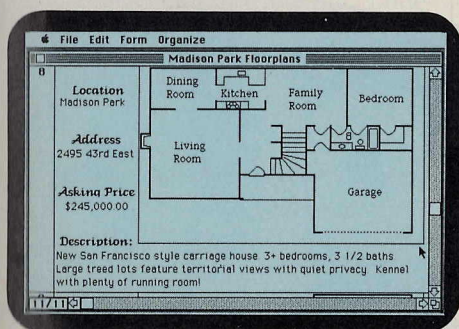
you can't find it.

It can calculate answers to questions like, how many dollars is this costing a square foot? Or, who earned the most commissions in August? Or, in what part of town do I make the best return on my time?

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A screenshot of the Microsoft File database interface showing a detailed analysis report. The window title is "File Edit Form Organize". The main area displays a table with the following columns: Location, Asking Price, Sq. Feet, Cost Sq. Ft., Features, and Style. The table contains 12 records. At the bottom of the window, it says "Records processed: 12 Records to process: 29" and there are buttons for "Resume" and "Cancel".

Location	Asking Price	Sq. Feet	Cost Sq. Ft.	Features	Style
Kirkland	\$235,750.00	2,300	\$102.50	Swimming Pool	Colonial
Everett	\$187,500.00	1,975	\$94.94	Verbar, Pool	Art Deco
Redmond	\$250,250.00	2,400	\$96.25	Terrace Garden	Early American
Edmonds	\$345,200.00	2,000	\$172.60	Redwood Deck	Tudor
Capitol Hill	\$275,500.00	2,350	\$117.23	Hot Tub, Sauna	Early American
Northpark	\$380,500.00	2,800	\$135.89	Tennis Courts	Colonial
Madison Park	\$450,000.00	2,050	\$219.51	Putting Green	Gothic
Highland Park	\$385,000.00	2,375	\$161.91	Kennel	Tudor
Queen Anne	\$275,400.00	3,100	\$88.84	Bay Windows	Victorian
Ravenna	\$245,500.00	2,150	\$114.19	Hot Tub	Gothic
Madison Park	\$495,000.00	3,900	\$126.92	Kennel, view	Tudor Blackhawk
University	\$192,750.00	2,000	\$96.38	View, view, view!	Modern
Jamestown	\$235,000.00	2,400	\$106.25	Tennis Courts	Tudor Classic

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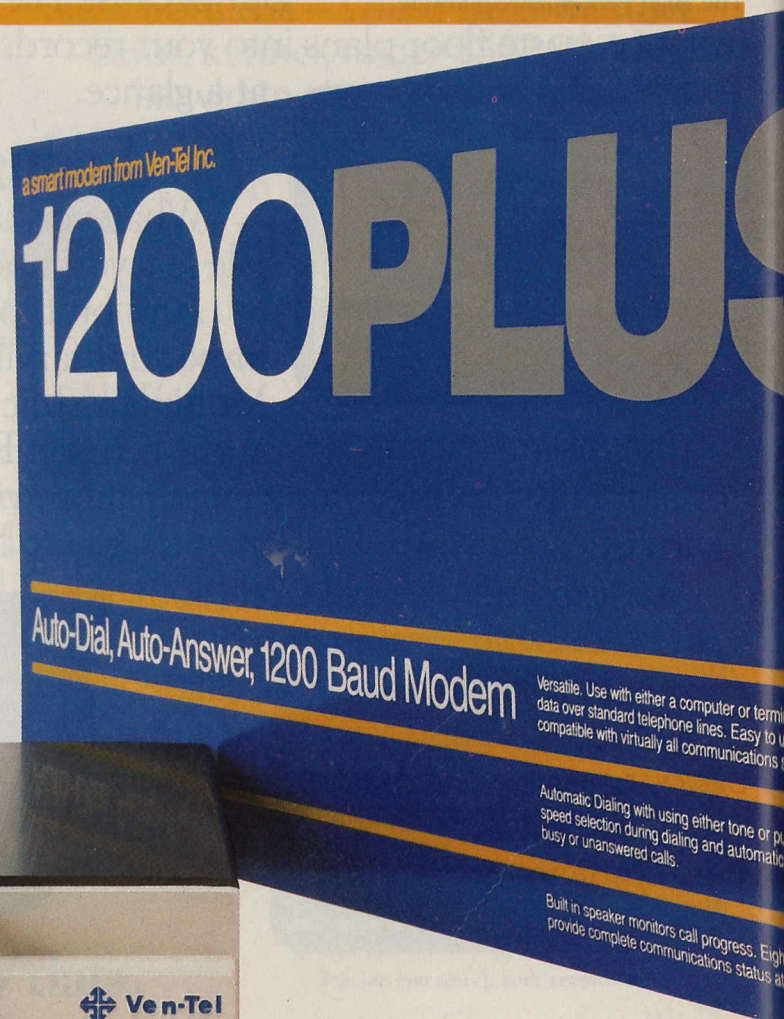
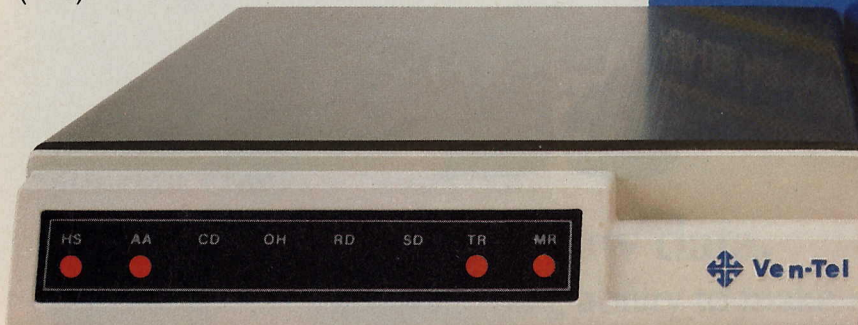
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natives by that criterion, the first-place topic faded to third. The more satisfying Nightclub Singers—long on creativity but no commercial potential—now narrowly led the list.

So what? If I had gone ahead and started the Nightclub Singers book the next day, I would now be able to justify it with a few charts. But actually, the fix had been in from the start. The decision-making process had been shaped by my own criteria, the weights I had assigned, and the way I applied the criteria to each topic. All it took was some tinkering to get things exactly the way I wanted them in the first place.

I had pulled back the veil of Lightyear and found myself working the machinery, like some abashed Wizard of Oz finally unmasked. Yet it was not as if I had previously made my mind up about a book topic at all—in fact I was genuinely undecided. Since Lightyear could not suggest a completely different topic, I had no more to gain from the program.

Consulting the Oracle

It was then that I decided to use one other decision-making program to help me in my plight. This too was a new program, but the technology it is based on is very old. There is no claim of trailblazing here. The name of the program is The Electric Dragon, published by Baen Software (subsidiary of Simon & Schuster). Its cost, \$34.95, is about \$460 less than the cost of Lightyear, and it is simply a computer version of the I Ching, the Chinese Book of Changes.

Do not laugh. For centuries, the I Ching has been used as a divining tool and a source of sagacity by extremely serious people, from Confucius to Jung.

The I Ching deals with our problems by asking us to choose, by random devices like tossing coins, one of 60 symbolic hexagrams. These are figures of six lines. Each line is similar to a computer bit in that it has only two states: firm or broken. By contemplating the combinations of these lines, the Oriental masters have interpreted each hexagram

with meaning that casts light on our specific problems.

Almost as if acknowledging my failure to achieve enlightenment via Lightyear, The Electric Dragon package states its promise: "At last, not just data, but *wisdom* from the computer." And while the program, from sparse documentation to rough-hewn banner screen, seemed rather minimalistic, that was only in keeping with its stated purpose. While it admittedly drew from only a portion of the Ancient Oracle's text (using the critically approved Wilhelm/Baynes-Bollingen Series edition of the I Ching), its purpose was to free the user from the "tedious details of creating or looking up the Hexagrams." While this seems like a fast-food approach to the wisdom of the ages, I admit that there is a delicious blasphemy to using the I Ching on an IBM PC, a machine that feels more at home while dealing with the line charts and graphs that Lightyear generates.

I Ching's Solution

It was as easy to waken the Electric Dragon as it was to get Lightyear started. When it asked if I wanted to type my question, I gladly complied; "What book should I write?" I asked my digital sage.

In turn it asked me to create a hexagram. Instead of the traditional form of hexagram creation using 49 yarrow stalks from the earth, the Dragon has you randomly poking at the keyboard. Three random keystrokes and the computer mysteriously displays the hexagram. So within seconds, a six-line hexagram appeared on my screen. The Electric Dragon told me it was the fifth of the 60 possible hexagrams. Its name was Hsu, and its title was Waiting (Nourishment). Underneath the hexagram was a poem:

— — — — —	K'AN	THE ABYSMAL, WATER
— — — — —	CH'IEH	THE CREATIVE, HEAVEN

WAITING. If you are sincere,
You have light and success,
Perseverance brings good fortune.
It furthers one to cross the great water.

Following that was a series of interpretations that analyzed the hexagram, elaborating on the image it created of clouds rising to heaven. One line stuck with me: "We should not worry and seek to shape the future by interfering with things before the time is ripe . . . Fate comes when it will, and thus we are ready."

So I had my answer. Hold steady, and the book topic will come. Do not force it. Forcing it, of course, was exactly what I was trying to do with Lightyear. Software made to generate decisions will do just that, and soon there may well be cadres of managers and "knowledge workers" of all stripes, churning out hundreds of decisions at the speed of Lightyear, just as the proliferation of spreadsheets has proved that computers can give any nebbishy accountant the power to paralyze an entire bureaucracy with rows and columns that stretch to eternity.

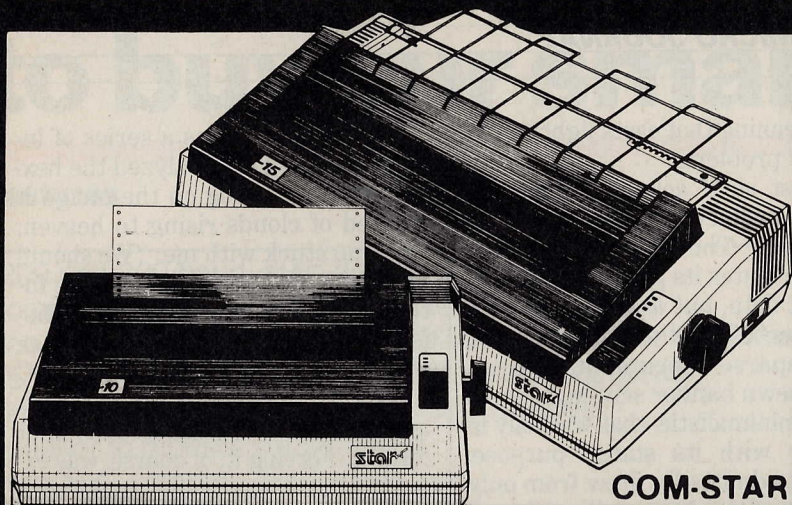
But will this decision-modeling software really help us with hard choices? Can it tell us, as the I Ching has for years told any who cared to listen, that there is more to life than what we can quantify?

John Couch's original session with Lightyear led him to join the management of a new company. But there are other sorts of questions that require one to stretch outward, beyond the criteria and weights he had figured. Any of a number of great books—novels, works of philosophy, and yes, the I Ching—might have provided insights to lead him in an entirely different direction.

I recall a brilliant programmer once telling me that we "shouldn't limit computers to the lies we tell them through keyboards." Just the same, must we limit ourselves to what may be processed through computers? All of us must make decisions about the direction our efforts must take, and I suspect that the I Ching has better answers for these questions than Lightyear can muster. □

Steven Levy welcomes your comments and suggestions. You can contact him on The Source (ID TCT670) or CompuServe (ID 72065,635) or by writing to him care of *Popular Computing*, POB 397, Hancock, NH 03449.

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The Image Sweepstakes

A company by any other name might not sell as sweetly

by Richard Benyo

What's in a name? For many well-entrenched companies, there's enough intrinsic value in names to keep legal departments working full-time to defend them against interlopers.

Take this sentence in a national magazine story for example: *She claimed that she'd xeroxed the contract, but James Bugmaster claimed he'd never seen it.* Within 10 days after the issue hits the newsstands, the magazine's editor can bank on receiving a cordial but firm missive from Xerox lawyers explaining that the name Xerox has been used in vain. The same is true of a number of product names that have come into general use.

But for companies in the fledgling, multi-billion-dollar computer industry, The Name is *everything*. These companies have spent plenty of time and money infusing their product names into the public consciousness. Say "AT&T" and, despite divestiture, most people think "telephone" (although it's beginning to mean "computer" to some). Say "IBM," and millions of secretaries think of electric office typewriters, while

for other millions it means "personal computer." "Apple" evokes a variety of images: if you're from Washington state, it's a fruit that grows on trees; if you're a Bible scholar, it's the same thing; if you are a Beatles fan, it's a record label; and if you're into microcomputers, well, there's this manufacturer in Cupertino, California...

All in a Name

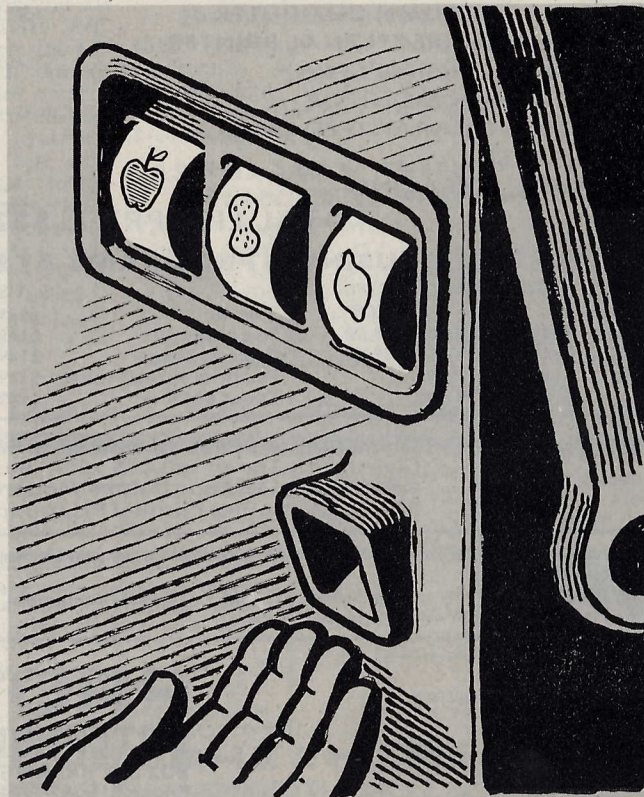
For an industry as formative and potentially profitable as the one

growing up around microcomputers, a good catchy name can be a shortcut to winning the image sweepstakes. It is the first line of marketing in a world still unsure of what a computer does and how it does it.

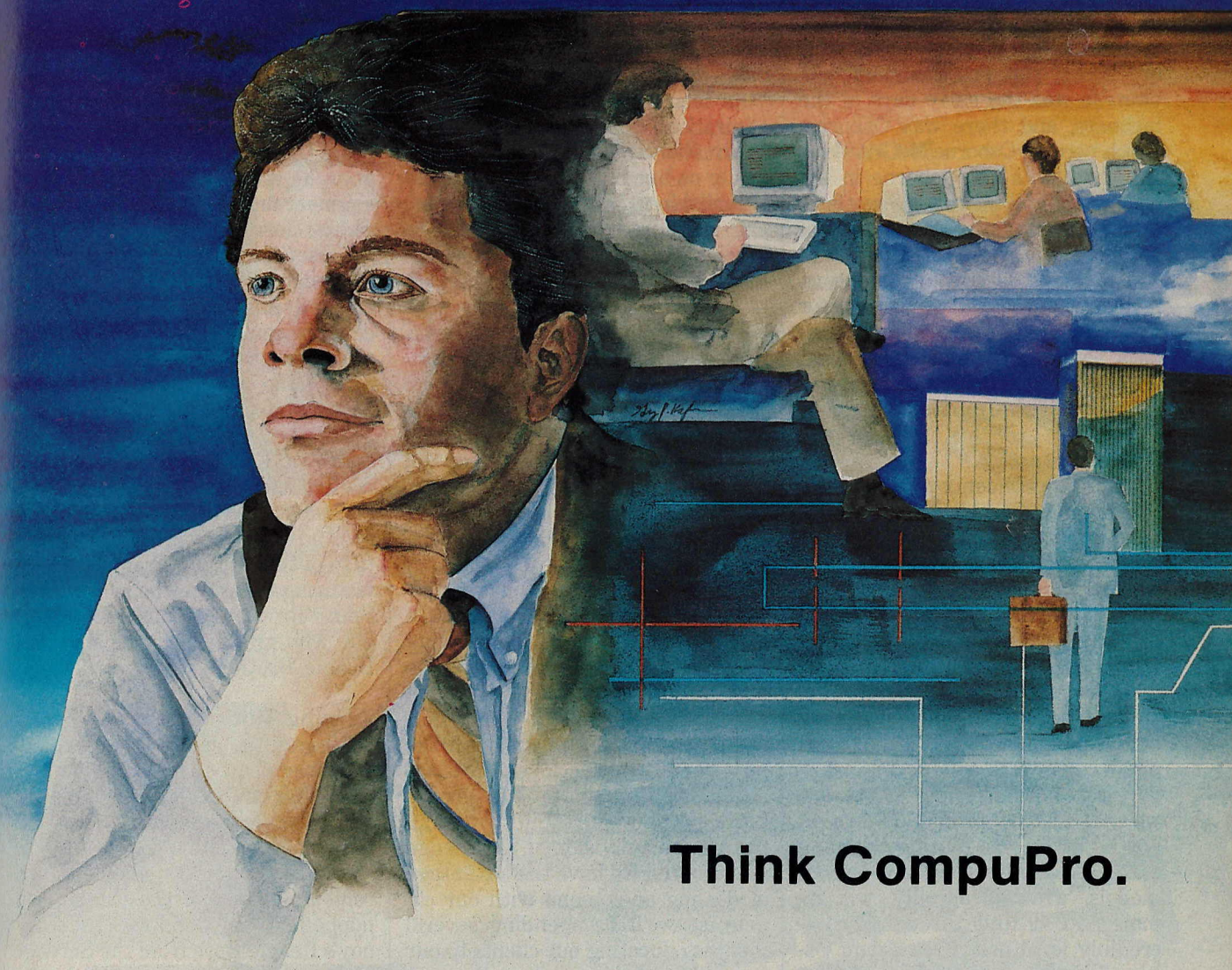
"Apple, for instance, is a nice, friendly name," says Adam Osborne, whose own last name adorned two companies prominent in the growth of the microcomputer industry: Osborne/McGraw-Hill (publisher of computer books) and Osborne Com-

puter Corp. (pioneer in portable micros, now being run by Ron Brown on a completely different scale and with an image different from the one Adam fostered). Osborne himself feels strongly about the importance of a proper name to help build a good image, even though his newest company (the Berkeley, California, software firm called Paperback Software) does not bear his name.

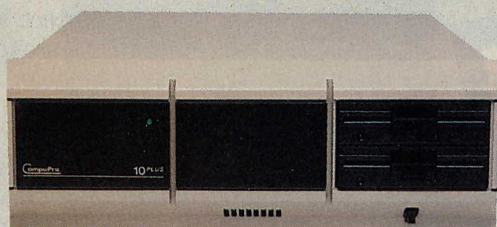
"What [a name] should do is create a link in the customers' minds between what they want and what they'd like to buy," Osborne opines. "Very frequently the answer is, 'Yes, you need a name that describes what you're doing.' Now, with Osborne Computer, we chose Osborne because I'd been writing



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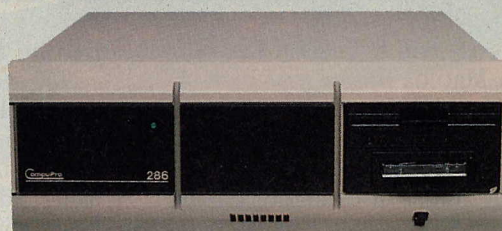


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my 'From the Fountainhead' column. It was the early days of the business, and there was Osborne, which became Osborne/McGraw-Hill. I chose not to use Osborne in the new company's name for fear there would be confusion on the part of potential customers thinking it was software for Osborne computers. And for that reason, we searched for a totally different name. Now, Paperback Software has a good ring to it; it's easy to remember and describes exactly what we're doing."

A Fresh Start

The rising phoenix of what once was Adam Osborne's computer company is located in Fremont, some 20 miles southeast of Paperback Software's headquarters. The new company is working hard to reverse its pre-Chapter 11 image of a high-flying management company.

"We're pretty frugal here," Ron Brown, the revived company's president, said in November at the frugal press conference announcing a frugal public stock offering. "Up to now we've kept a low profile," Brown reported as he was touting the company's Vixen (Osborne 4) and Encore models, which, ironically, will be marketed at first through the incredibly loyal user base Adam Osborne's flashy style and revolutionary product created.

Across San Francisco Bay in Palo Alto, Matilda Butler, president of the 5-year-old Edupro, is in a unique position to comment on the importance of a name, for her company is in the midst of changing names.

Founded in 1980, Edupro became successful by offering educational software customized to accommodate two, three, or four students on one Atari unit, allowing them to work jointly or individually (but socially) on separate portions of the screen. Edupro also joined with the Educational Testing Service to put together a stand-alone database of the 2700 United States colleges and universities contained in the Princeton-based testing company's 1500-page college guide.

This venture into stand-alone data-

bases opened a new door for Edupro. "Our focus now is working with organizations that already have the information available on a printed index or on-line but who want to make it available in a stand-alone format. Our initial market is corporate libraries, but we'll eventually be expanding to public libraries and individuals," Butler says.

The company's new name, Knowledge Access, is descriptive, uncomplicated, yet contemporary. But how will Butler and her staff get the new name across to her customers?

Fortunately, she doesn't face the problems of companies trying to sell to the mass market; her customers are primarily other companies who want Edupro . . . er, excuse me . . . Knowledge Access to format and repackage their information to make it more accessible in the growing stand-alone database market. "The biggest problem during the change-over will probably be in remembering to answer the phone with the new name," Butler jokes. "We are still going to maintain and service our Edupro products, but now Edupro will be a division of Knowledge Access. And we have the advantage of dealing one-on-one with our clients, so we'll be spending several months educating our clients to our new directions."

Selling the Image

Not every computer company enjoys such luxuries. Most must get the company's name, its products, and its image across through judicious advertising and marketing. Each company does it differently, and in so doing defines its style (both within the industry and to the public) and, to some extent, its market and its company image. Let's look at three more instances, ranging from the absurd (but very effective) Beagle Bros. to the serene (and equally effective) Software Publishing Corp.

Eclectic is too conservative a word to use in describing the brainchild of San Diego's Bert Kersey, perhaps the most famous grassroots counterculture entrepreneur in big-league

software publishing. Kersey is a model-train fanatic who majored in electrical engineering at San Diego State University because, the legend goes, he wanted to be a locomotive engineer and electrical engineering was as close as they came at SDSU.

Kersey kind of puttered his way into designing software after he discovered computer games and decided he could write games too. His real fame came from a collection of utilities he created for Apple computers, a product his customers had asked for. After five years in the business, Kersey still believes that it's self-defeating to protect software, and he still writes and designs his own ads: distinct creations with a turn-of-the-century graphics flavor featuring two guys who look like the Smith Brothers of cough drop fame but who are, in fact, the mythical Beagle Brothers.

Turning Things Around

Where'd the name come from? In a 1983 interview with *Softalk* magazine, Kersey explained: "All the names with *soft*, *data*, and *micro* were already taken. Besides, I wanted a name that people would remember. One of the things that popped into my mind was Walt Disney's Beagle Boys from the Scrooge McDuck comics, so I chose that."

Walt Disney likes to protect its goods, however. Kersey got around the roadblock by being flexible: "I just changed B-o-y-s to B-r-o-s, and I had a company." In November of 1981, Beagles' DOS Boss premiered in third position on the *Softalk* Hobby Top 10 software listing; in March of 1982, the company's Alpha Plot broke into the Hobby Top 10. The rest is history.

Kersey has no grandiose plans for Beagle Bros. Despite its success, the operation is still small and low-key. But Beagle Bros. posters still adorn the walls of programmers' cubicles in many big, conservative software houses, attesting to the penetration of his counterculture image.

A publisher who will be busy

Richard Benyo is executive editor of *Runner's World* magazine.

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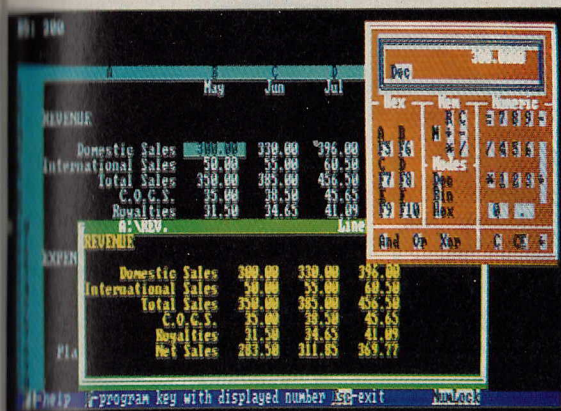


And he's not the only one talking:

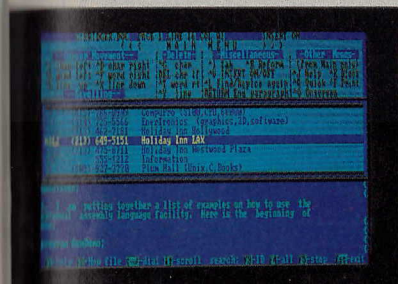
Charles Petzold, PC Magazine: "In a simple, beautiful implementation of WordStar™'s block copy commands, SideKick can transport all or any part of the display screen (even an area overlaid by the notepad display) to the notepad."

Jerry Pournelle, BYTE: "If you use a PC, get SideKick. You'll soon become dependent on it."

Garry Ray, PC Week: "SideKick deserves a place in every PC."

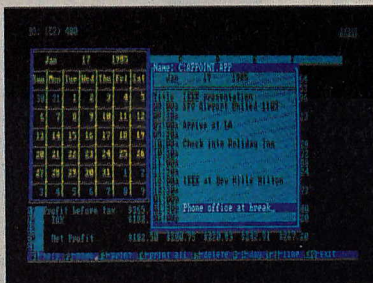


Here's SideKick in action with Lotus® 1-2-3 running underneath. Data has been imported from Lotus to SideKick's notepad, shown in the lower portion of the screen. The notepad is a full-screen editor that lets you import and export data; it utilizes WordStar commands to let you time- and date-stamp notes and save them to disk. The SideKick calculator, shown at the upper right, offers memory capability, nested parentheses, and the ability to convert decimal to hexadecimal or binary. It even lets you transfer resulting figures to your underlying application.



The telephone autodialer/directory places calls for you via your Hayes™-compatible modem and locates numbers from one of the program's several directories. Here the dialer is running on top of WordStar.

The calendar can record appointments, records and notes—yours or those of the entire department—up to the year 2099. Here the dialer is running on top of Lotus.



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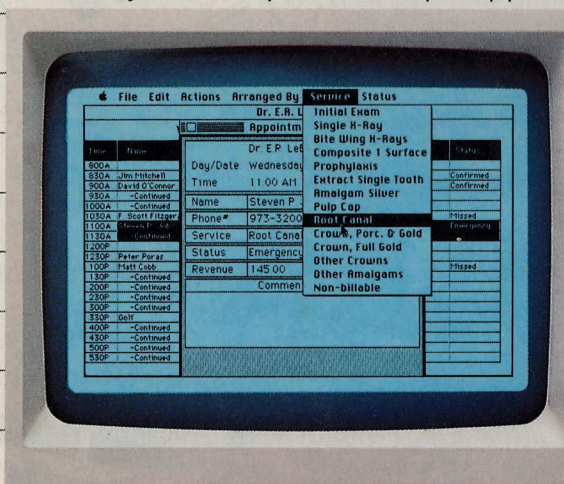
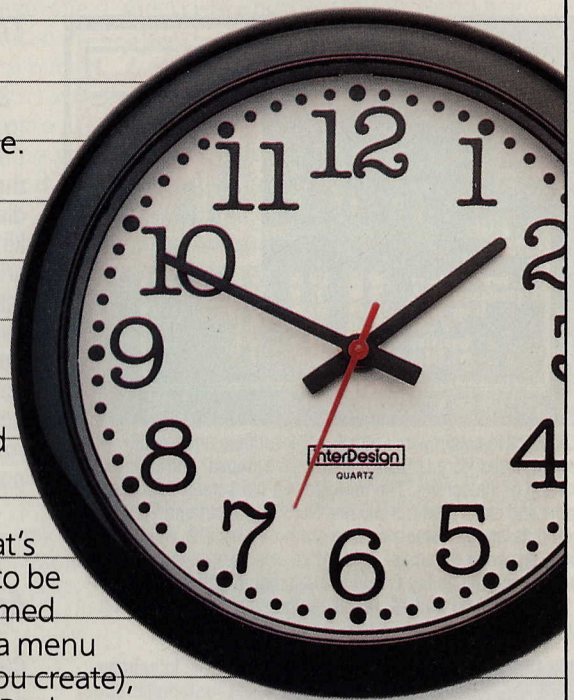
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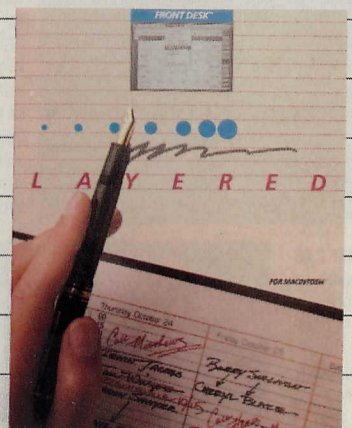
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Inquiry 31

keeping one product line straight from the other is Spinnaker Software, in Cambridge, Massachusetts. In an October 1984 interview in *Publishers Weekly*, the trade journal of the book industry, president Bill Bowman described Spinnaker's marketing focus, around which the company has structured its image:

Our plan essentially was to find a segment of the home marketplace that was not developed, that had big potential, and where marketing could play a very major role. So we developed a business plan aimed at the home educational segment, because the companies in that market were basically technology- or educator-led companies and not market-driven companies. We felt that by really changing the product, making it with good color graphics and sound combined with terrific packaging, heavy advertising, and professional promotion and selling, we could become a major supplier of home educational software.

The business plan obviously worked. Spinnaker now claims 50 percent of the home educational software market, with anticipated 1984 sales of nearly \$30 million—almost triple its 1983 sales of \$11 million.

But Spinnaker faces a very real challenge in its current proliferation of products. The company entered the market with four pieces of software. By early autumn of 1984, it had 30 Spinnaker products and nine Fisher-Price pieces on the market. In October the company launched its Trillium division with six titles. (Trillium markets adventure games based upon science-fiction novels, such as Ray Bradbury's *Fahrenheit 451*.) Windham Classics, another Spinnaker division, will do the same with *Swiss Family Robinson* and other classic novels. In the works are the Nova line linked to the PBS television series and the Better Living series, scheduled for this spring. You might think it would be difficult to keep track of the products without a scorecard, but Spinnaker's huge advertising budget (well over \$4 million in 1984) will see to it that there's no confusion in the minds of the consumers.

In November of 1984, a very quiet software company with a low advertising budget in Mountain View, California, made a splash on Wall Street by going public. Software Publishing Corp., which specializes in the PFS: series of small-business software, did \$23 million in business with only seven products in its fourth year of operation.

The positive bottom-line numbers at Software Publishing complement its image as a responsive and customer-oriented company, according to Susan Dahle-Fuller, marketing communications manager:

Our image has evolved over the years along with our product line. We started with PFS: File and expanded to seven products . . . Much of our product evolution comes from input from our customers. We have technical support systems, and they provide good feedback from customers. For example, a customer called and wanted to be able to do calculating within PFS: File, so we added that option.

Beginner's Tips

That's all well and good if you're one of the (relative) old-timers in the industry, such as the four we've just looked at. But how does a newcomer break into the image sweepstakes?

Very carefully, according to Edupro's Matilda Butler, who feels that the industry has some fence mending to do:

Many of the high technology companies and many of the software companies are not well thought of. There are a lot of Chapter 11s, a lot of products not shipped after being launched, a lot of hollow hype. Many of us are very concerned about the overall image of the industry, not just the image of a particular company. I'm always very happy when a company is successful, because it is going to take a lot of successful companies to make the industry as a whole successful.

Someone who is starting a company or has a company and wants to see it grow has to go back to the basics of what makes a good company work. Good management is the key; your customers aren't going to respect you no matter what you put into advertising and into creating a clever name for your com-

pany if you don't deliver the service and the reliability that the customers want.

The industry was started by people who were not necessarily business people but rather people who had good ideas or who were good programmers, and that's probably why we've had the problems we've experienced. A company should function as though it's here for the long run, even though that's a strange term to use for an industry so young.

Adam Osborne agrees, warning against marketing an image or a name before you have something to market. "If you've got nine months or a year to go before you have a product, do you bring a marketing person in?" Osborne asks. "The big mistake those guys at Ovation made was to pour everything into marketing when they were still a year away from having a product. What happened is that everyone drooled at the stories this phenomenal marketing department was putting out and ended up scratching their heads wondering when there was going to be any substance behind the stories"

But back to the name. Is it wise for a company to have a name that—at least to the novice—doesn't make any sense?

"A lot of companies do that," Osborne says, "and it's extremely foolish and indicative of their lack of marketing savvy. For example, I strongly suspect that Pearlsoft suffered grievously in the early days of the business and possibly lost a chance to be a dominant factor by calling its product Personal Pearl. Most people thought the company was in the jewelry business. You had no idea whether its product was a software package or a program generator. In general, if you're scrambling for visibility, you need every advantage you can get."

Does Cab-Tek Inc. sell communications systems for taxi cab companies? And does T&A Diversified Products have to mail pieces stamped "Sexually Oriented Materials"? Well, the answer is no in both cases—both companies sell computer furniture. Who would've guessed? □

**I HAVE TO QUICKLY ORGANIZE
20 IDEAS. HOW CAN A
PERSONAL COMPUTER HELP ME?**



HERE'S HOW:

FRAMEWORK SOFTWARE

We're about to show you how easy it is to use a personal computer if it's loaded with the right software. Even if you don't have a computer and a copy of Framework™ business software from Ashton-Tate™ in front of you, read these directions anyway. They're so simple we know you'll get the idea. Then save this ad and take it with you to a computer dealer for a Framework demonstration. Just follow the directions step-by-step and discover how great it feels to be in control of the computer.



Press the Ins key The Create menu appears.



Press the (up) arrow key You've selected Outline.



Press the Return key A skeleton outline appears.

Type the word **Outline**
"Outline" (the name you've

given the outline) appears on the frame border.



Press the Return key You've finished entering the name of the frame.



Press the grey + key The blinking cursor moves from the border into the frame to heading 1.

Type the heading you want for 1. The words appear in the outline and at the bottom of the screen.



Press the Return key Heading 1. is complete.



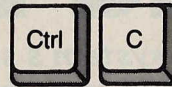
Press the (down) arrow key The cursor moves to 1.1.



Type what you want and press the Return key Heading 1.1 is filled in.



Press the (down) arrow key The cursor moves to 1.2.

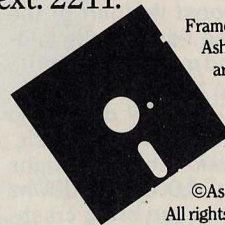


To add a heading anywhere, **press the Ctrl key and C key together, then press the E key.**



To add a sub-heading, **press the Ctrl and grey + keys together.**

There. See how easily you can organize your ideas right on the PC screen? And it's just as easy to organize spreadsheet, data or graphics within the outline as well. Even if you've never touched a computer before, we'll put you in control with Framework. For a dealer near you call (800) 437-4329, ext. 2211 or in Colorado, (303) 799-4900, ext. 2211.



Framework, and Ashton-Tate are trademarks of Ashton-Tate.

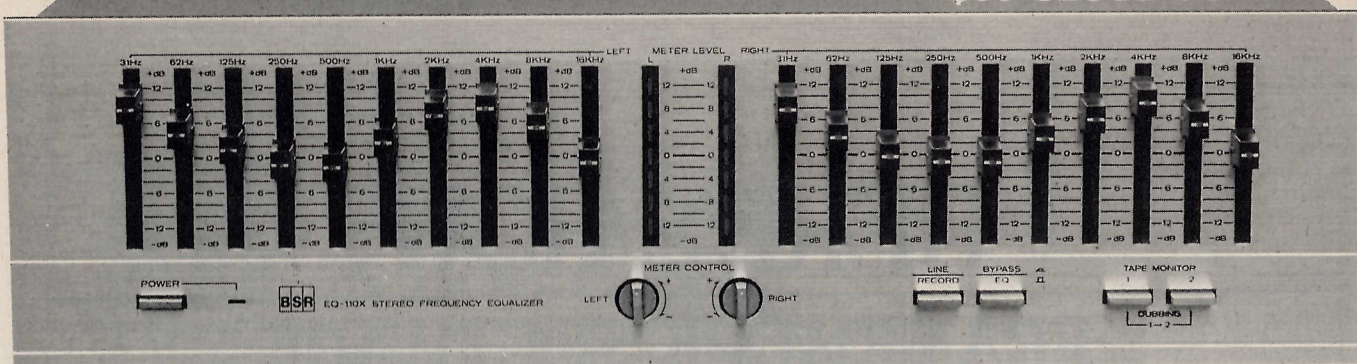
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Software from

ASHTON-TATE™

We'll put you in control.

\$89 CLOSE-OUT



Sound Detonator Plus

Make your stereo system's sound explode with life. Improve the sound quality by 30 to 50%. Plus, you'll add tape dubbing too with this limited BSR \$89 close-out.

It's like night and day. Crashing cymbals, the depth of a string bass, more trumpets or more voice will come bursting forth from your stereo at your command.

You'll make your music so vibrant that it will virtually knock your socks off when you use this professional quality 10 band stereo Sound Detonator Plus Equalizer.

It has a frequency response from 5hz to 100,000hz ± 1 db. BSR, the ADC equalizer people, make this super equalizer and back it with a 2 year limited warranty. Our \$89 close-out price is just a fraction of its true \$249 retail value.

CAN YOUR STEREO SOUND BETTER?

Incredibly better. Equalizers are different from regular bass and treble controls. And, 10 band EQs are the best.

Bass controls turn up the entire low end as well as the low mid-range, making the sound muddy and heavy. With an equalizer, you simply pick the exact frequencies you want to enhance.

You can boost the low-bass at 31hz, 62hz and/or 125hz, and the mid-bass at 250hz and 500hz to animate specific areas of the musical spectrum.

And, when you boost the part of the bass you like, you don't disturb the mid-range frequencies and make your favorite singer sound like he has a sore throat.

The high frequencies really determine the clarity and brilliance of your music.

You can boost the mid-range and highs at 1,000hz, 2,000hz, 4,000hz, 8,000hz and 16,000hz. So, you can bring crashing cymbals to life at 16,000hz while at the same time you cut tape hiss or annoying record scratches at 8000hz.

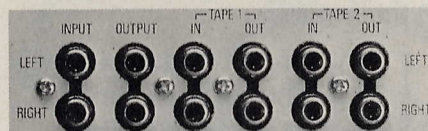
You can also boost or cut specific mid-range frequency areas to add or subtract vocal, trumpets, guitars or whatever instrument ranges you prefer.

GREAT FOR 2 TAPE DECKS

You can push a button and transfer all the equalization power to the inputs of two tape decks. So, if you have a cassette deck in your car or a personal stereo that you wear, now you can pre-equalize your cassettes as you record them.

Now you can get all the dramatically enhanced sound wherever you are. This

is an especially great feature for bass starved portables and high-end starved car stereos to make them come alive.



And, look at this. There are two tape inputs and outputs, so you can dub from tape deck A to B, or make two tapes at once with or without equalization.

EASY HOOK UP

Use your tape monitor circuit, but don't lose it. Now your one tape monitor circuit lets you connect two tape decks.

Just plug the equalizer into the tape 'in' and 'out' jacks on your receiver. We even supply the cables.

As you listen to your records, FM or 'aux', any time you push the tape monitor switch on your receiver you'll hear your music jump to life.

The output from your receiver is always fed directly to your tape decks for recording, and with the touch of a button, you can choose to send equalized or non-equalized signal to your recorders.

When you want to listen to a tape deck, just press a tape monitor button on the equalizer and your tape deck will work **exactly** as it did before. Except, that now you can choose to listen with or without equalization and you can dub.

You won't be listening to any distortion or hum. The Sound Detonator Plus has a 95db signal to noise ratio and total harmonic distortion of just 0.018%.

Once you've set your equalizer controls, switch it in and out of the system. You'll hear such an explosive improvement in sound, you'll think you've added thousands of dollars of new equipment.

WHY A CLOSE-OUT?

Last year DAK closed out over 18,000 of BSR's 7 band equalizers because BSR had decided to only sell equalizers under their ADC name and they still had some left with the BSR name on them.

Well, as Detroit comes out with new cars each year, ADC comes out with new equalizers. We got them to supply us

with just 15,000 of last year's model before they shut down for the new one.

They had already paid for all the tooling, all the research and design, so we were able to buy these for less than half the normal price, for cold hard cash.

So, you can go to any HiFi store and buy this year's design in an ADC equalizer made by the parent company BSR, or you can get this \$249 value BSR equalizer while our limited supply lasts, for \$89.

THE FINAL FACTS

There are 20 slide controls, each with a bright LED to clearly show its position. Each control will add or subtract up to 12db. (That's a 24db range!)

There are separate sound detonator slide controls for each channel at 31hz, 62hz, 125hz, 250hz, 500hz, 1,000hz, 2000hz, 4000hz, 8000hz, and 16,000hz.

LED VU meters with ± 0.5 db accuracy show levels for each channel. It is 17" wide, 6 1/2" deep and 4 1/2" tall.

PUT LIFE INTO YOUR MUSIC RISK FREE

Prepare for a shock the first time you switch in this equalizer. Instruments you never heard in your music will emerge and bring a lifelike sound that will envelop you and revolutionize your stereo system.

If your system doesn't spring to life, simply return the equalizer within 30 days in its original box for a refund.

To order your Sound Detonator Plus Tape Dubbing BSR 110X 10 Band Stereo Frequency Equalizer risk free with your credit card, call toll free or send your check not for ADC's \$249 value, but for only \$89 plus \$7 for postage and handling. Order No. 9724. CA res add 6% tax.

Wake up the sound in your stereo. Your sound will explode with life as you detonate each frequency band with new musical life. And now you'll be in control of two tape decks as an added plus.



DAK INDUSTRIES INCORPORATED

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8200 Remmet Ave., Canoga Park, CA 91304

Growing Up with Computers

A new book reveals some troubling educational issues

by Dan Watt

What makes computers so fascinating to the younger generation? How do computers change the way children think? In what different ways do children react to computers?

Such questions—terribly important for parents and teachers—are at the core of a provocative new book titled *The Second Self: Computers and the Human Spirit*, by Sherry Turkle (Simon & Schuster, 1984). A sociologist and psychologist on the faculty of MIT's Project on Science, Technology, and Society, Turkle presents conclusions based on eight years of research into the subtle yet often profound relationships between computers and people.

The Second Self focuses on the "subjective computer . . . the machine as it enters into social life and psychological development, the computer as it affects the way we think, especially the way we think about ourselves," says Turkle. The most interesting questions for her are "not what the computer will be like in the future, but instead, what will we be like? What kind of people are we becoming?"

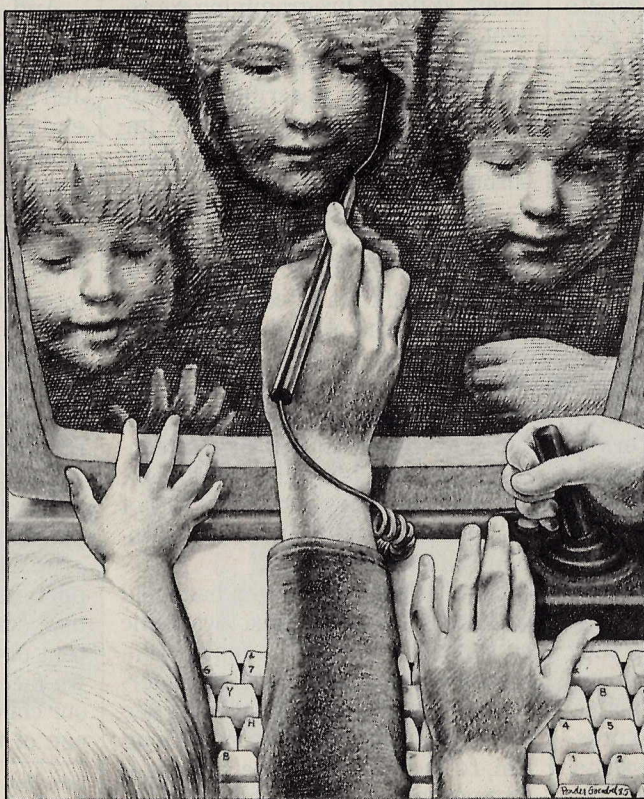
For answers to these

questions, Turkle interviewed hundreds of computer users and observed a broad range of people/computer relationships: toddlers playing with handheld computer toys, young programmers learning Logo in schools, regular players of video games, compulsive hackers bending giant computer systems to their wills in the midnight labyrinths of MIT, artificial intelligence (AI) researchers striving to create computer programs that reason and

learn, and the first generation of personal computer owners. What all Turkle's subjects had in common was an intense personal involvement with computers, and as the title of her book suggests, this involvement says as much about the computer users as it does about the machines themselves.

Almost half of *The Second Self* examines children's attitudes about and reactions to computers. While the classic stages in childhood development are to a large extent preserved in these youngsters' interactions with computers, they are often intensified.

The youngest children typically have a meta-physical relationship with the machines—they wonder if computers are alive, if they have feelings, if they can cheat at games, and if they really think. Once children reach the age of 7 or 8, though, this characteristic wonder gives way to a strong need for mastery, whether it be winning at video games or writing programs to gain control of the machines. Youngsters moving into adolescence illustrate still another relationship, relying on the computer as an aid in their own search for identity and tending to "throw themselves into



programming the way others devote themselves to fixing cars."

Citing the studies of Swiss psychologist Jean Piaget, Turkle shows how young children spend hour after hour building their own theories about living and nonliving objects. Clouds that move across the sky, cars on the highway, and trees whose branches wave in the wind, along with birds, dogs, butterflies, and people, are all seen as living objects by the youngest children.

All of these objects share the attribute of motion, the most salient feature of "aliveness" in a young child's mind. Eventually, it all gets sorted out in the course of growing and thinking, and motion gives way to more accurate criteria.

But what is one to make of Merlin, an electronic toy that usually wins—but occasionally loses—at tic-tac-toe? Turkle describes a discussion among a group of 6- to 8-year-olds. Robert accuses Merlin of cheating and wants to break its "brains." Greg argues that Merlin doesn't really know that it's cheating. Jenny insists that you can't cheat without knowing you're cheating. And the debate rages. Is Merlin alive? Does it have intentions, consciousness, feelings? Citing many fascinating examples of such childlike philosophy, Turkle implies that kids who grow up debating such issues will get a head start on more profound reflections about what it means to be human.

Hard and Soft Masters

For teachers and parents, the chapter on children as programmers may be the most significant in the book. After observing children learning to program computers in several different settings, Turkle was able to recognize a couple of distinct styles. "There is a strong tendency among teachers to think that there is only one way to teach programming. What I found was that if you give kids a chance, they will make the computer their own, but in their own ways," she explains.

"Programming style is an expression of personality," Turkle asserts, reflecting on the work of many dif-

ferent children. Consider Jeff and Kevin, who both programmed animated space scenes. "I wrote out all the parts on a big piece of cardboard," Jeff explained. "I saw the whole thing in my mind just in one night, and I couldn't wait to come into school to make it work." During the whole process, Jeff was more concerned with getting his program to work than he was with the actual appearance of his rocket ship.

Kevin, on the other hand, was more interested in the way his spaceship looked than in the programming that created the images. First he designed a rocket shape, then added flames shooting out the back and a cockpit for the pilot. Once he figured out how to make the ship move, Kevin experimented with lots of different motions to get the one he liked, often stepping back to observe the screen from different angles as he worked. Finally, he added a background of stars and planets. "I think of myself as the man inside the rocket ship. I daydream about it," said Kevin.

Jeff's and Kevin's distinctly different styles of programming represent a dichotomy that Turkle saw again and again. She uses the term *hard mastery* to describe Jeff's approach: "Hard mastery is the imposition of will over the machine through implementation of a plan . . . [It's] more like getting 'to say one's piece,' " the author explains, "than allowing ideas to emerge in the give-and-take of conversation."

Kevin, on the other hand, is what Turkle refers to as a *soft master*: "Kevin is like a painter who stands back between brush strokes, looks at the canvas, and only after this contemplation decides what to do next . . . Soft mastery is the mastery of the artist . . . more like a conversation than a monologue."

The distinction between hard and soft mastery is not just academic hairsplitting, Turkle feels. She argues persuasively that an understanding and accommodation of the two styles holds the key, in the long run, to the success of the computer literacy movement in the schools.

"To be alienated from the computer is to be disenfranchised in our society," Turkle explains. "People should learn whatever they have to learn to feel that this thing belongs to them. The most important thing that computer literacy programs can do for people is to give them the sense that they can be empowered by the machine."

Exclusive Literacy?

But Turkle fears that the pressure for computer literacy programs in schools could deny such opportunities to many youngsters. "We seem to be stuck with a cultural image of the computer as something made by engineers for engineers," she says. "In classrooms, kids are being taught that there's only one right way to program the computer—the hard mastery approach. If we ignore the idea of the computer as a subjective medium shaped by the user, as an expressive medium accessible to people with 'soft mastery' styles, we're going to be excluding lots of people from participation in the computer culture."

And soft masters like Kevin won't be the only ones to suffer. If our education system strongly fosters Jeff's hard mastery, where will he end up? Speaking of another hard master, Turkle writes: "There exists a waiting culture of master programmers he can join—a culture that may reinforce and reward his exclusive involvement with the machine. The interactivity of the computer may make him feel less alone, even as he spends more and more of his time programming alone. There is a chance that the computer will keep him lost in the world of things."

Turkle may have barely scratched the surface in documenting the experience of the first generation to grow up with computers, but the important point is that she has given us a start. Such careful and consistent observations will be critical as we face the challenge of helping all our children become competent in an age of technology. □

Dan Watt is a contributing editor of *Popular Computing*.

READ ONLY



A review of the IBM Personal Computer Family. Vol. 2, No. 1



GRAPHICALLY SPEAKING

E Pluribus Unum. IBM Personal Computer graphics hardware covers a lot of territory, from graphics cards and monitors to printers and plotters. Color monitors alone are available in four models that can satisfy varying levels of color graphics requirements, from home or office to the laboratory.

Two of the most recent, for example—the IBM PC Enhanced Color Display and the IBM PC Professional Graphics Display—offer advanced business and technical graphics capabilities. The IBM PC Enhanced Graphics Adapter can also be used to

extend some of those capabilities to the IBM PC Monochrome Display and the IBM PC Color Display.

This growing array of hardware products is unified by a strong IBM Personal Computer graphics software development strategy, one that can dramatically improve your programming efficiency and broaden the application potential of your graphics programs.

Independence. Graphics software has traditionally been written for a specific graphics device and couldn't be run on a second device without complex and time-consuming reprogramming. By using the IBM Personal Computer Graphics Development Toolkit, however, you can now develop software that is compatible with all existing IBM PC graphics hardware products.

This is possible because the Toolkit contains a constant interface—the Virtual Device Interface—to which all applications can be written. The result is device-independent software.

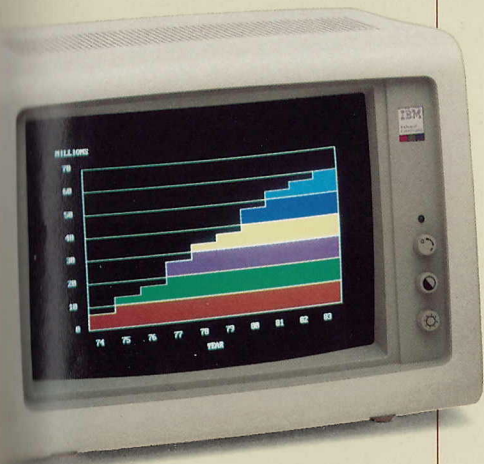
The Graphics Development Toolkit allows you to program bit-map

graphics to a 32K x 32K addressable point window and to combine graphics and text capability on a variety of graphics devices. The device drivers necessary for information exchange with existing IBM PC graphics devices are included in the Toolkit, as are a driver for the IBM PCjr Video Subsystem and language interfaces for the IBM BASIC, FORTRAN, C, and Pascal compilers and for the IBM Macro Assembler.

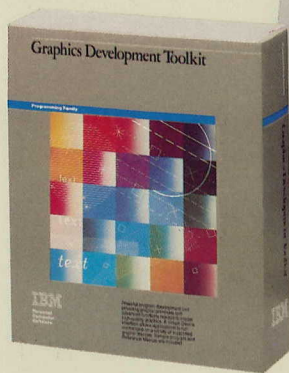
The right tools. Several products from the IBM PC Engineering/Scientific Series also play an important part in the IBM PC graphics programming strategy. All of them incorporate the Virtual Device Interface discussed above.

The IBM Personal Computer Graphical Kernel System—which is consistent with Draft ISO and ANSI GKS Standards—gives you a common high-level graphics language that can help further simplify your programming tasks. It also helps increase the portability of applications between computer systems.

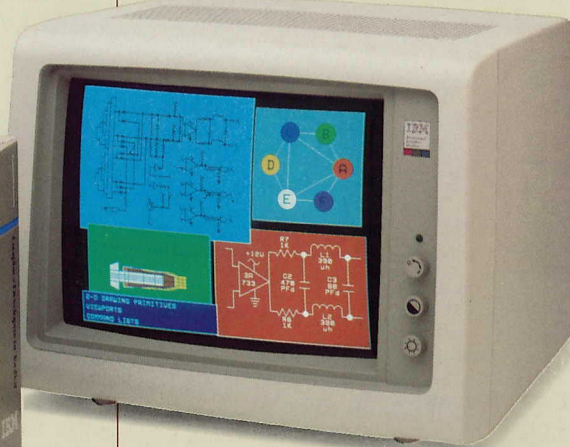
In addition, the IBM Personal Computer Plotting System provides a



*IBM Personal Computer
Enhanced Color Display*



*IBM Personal Computer
Graphics Development Toolkit*



*IBM Personal Computer
Professional Graphics Display*

subroutine library of functions that help make it easy to produce a wide variety of charts and graphs. There's also a Metafile Interpreter available to facilitate retrieving and manipulating graphics images.

This range of IBM graphics programming tools is designed to help speed and simplify nearly every aspect of your graphics programming work. They can substantially reduce the time and tedium involved in program development, and the device independence they provide can help increase the flexibility of your finished programs. Device independence also helps extend the life—and marketability—of your programs, because applications developed with the Virtual Device Interface can interface with future generations of graphics devices.



HARDWARE NEWS

Lock and key. Troubled by people who try to peer without permission at sensitive business or personal data stored in your IBM Personal Computer? You can go a long way toward locking it up with the IBM Personal Computer Keylock Option.

Fifteen minutes and a screwdriver are all you need to install the Keylock Option on your IBM Personal Computer, IBM Personal Computer Expansion Unit, IBM Personal Computer XT, IBM Personal Computer

XT/370, or IBM 3270 Personal Computer.

Once your system unit is outfitted with the Keylock Option and locked, it will be difficult for someone without the proper key to access the hardfile and all the valuable software it contains. Also, other users in a network won't easily be able to access or tamper with data stored on your system. In fact, when the Keylock Option is installed, the system unit can be powered up only with the key and can't be powered up through the CRT plug port.

And with the Keylock Option locked in place, the system unit cover can't be removed—short of forcible entry—by just anyone who might want to browse around inside your IBM PC during off hours.

Small packages. If you need more memory but don't have a full-size slot available in your system unit, the IBM Personal Computer 256KB Memory Expansion Option may be the answer. It offers 256KB of additional memory on a short card (5 inches rather than 11 inches) with a comparably diminutive price.

That makes it ideal for adding memory to the IBM *Portable* PC. This Memory Expansion Option is also a compact way to beef up your IBM Personal Computer or IBM Personal Computer XT (which has two slots for short cards).

Talkies. The combination of film and sound revolutionized the movies. Speech capability may soon spell an equally big change for computers. The IBM PC_{jr} Speech Attachment is a step in that direction.

It's a side-attached option for the PC_{jr} that permits speech and sound under control of software such as IBM Writing to Read.* The Speech Attachment contains 196 words and sounds in its ROM. Cartridges manufactured with prerecorded speech can be used under program control. And with the purchase of a microphone and the proper software, you can even record your own speech data on an IBM PC_{jr} diskette.

So far, at least, the last word is ours.

*Developed by Dr. John Henry Martin.



WHAT'S THE PROGRAM?

Retrieval. Whether you work with pen and paper or the latest word processing software, writing documents is only half the battle. Try finding them again a month later.

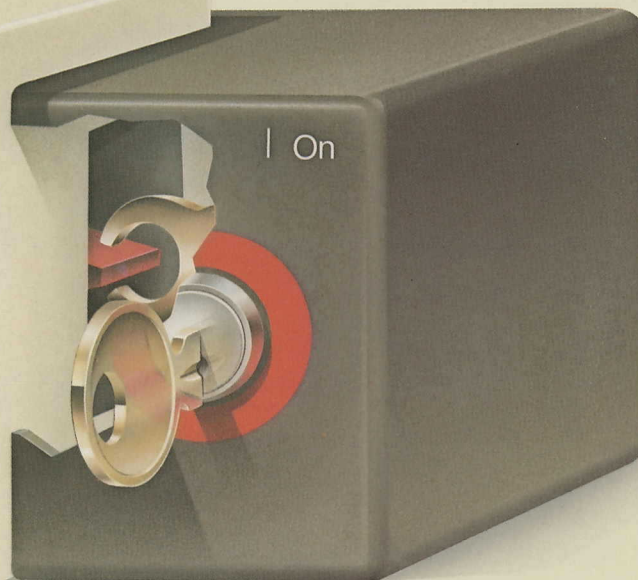
We don't claim to have discovered a better system for paper filing. But a new software package from IBM—Office Correspondence Retrieval System (OCRS)—does promise to make life a lot easier for those who store written work on a fixed disk or who have a library of documents stored on diskettes.

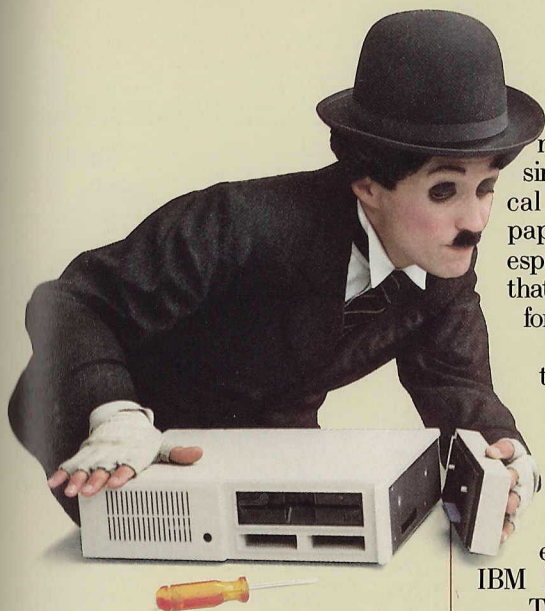
OCRS can help in two ways. First, it makes document abstracts and stores them in a summary file for future reference. OCRS automatically searches out keyword information such as date, subject, sender, or any other significant word. You can also add keywords other than those actually contained in the document.

Second, and most important, simple English language queries will prompt OCRS to locate the original document. A document search request can be entered as individual words or complete sentences. You don't need to learn a special query language.

OCRS can abstract and retrieve any type of file containing ASCII text such as letters, charts, and computer programs. It can also directly abstract documents written with IBM

Help protect your software and hardware with the IBM Personal Computer Keylock Option





IBM PCjr Speech Attachment

Writing Assistant, IBM PCWriter, and WordStar® and documents using the IBM Revisable Form Text Document Content Architecture (RFTDCA). Documents can be converted to RFTDCA data format by IBM DisplayWrite 1 and 2 and PCWriter.

With OCRS, missing reports may be a thing of the past.

Evolution. Like their human language counterparts, computer languages and operating systems change and evolve. Occasionally, an entirely new dialect crops up, such as the IBM Personal Computer XENIX® Operating System.

IBM Personal Computer XENIX is derived from the UNIX® Time Sharing System. Several enhancements designed specifically for the IBM Personal Computer AT allow you to take full advantage of its power. IBM Personal Computer XENIX supports both single-user and multi-user configurations. It also enables you to run several programs at the same time—you can, for example, compile a program in the background while you edit one in the foreground.

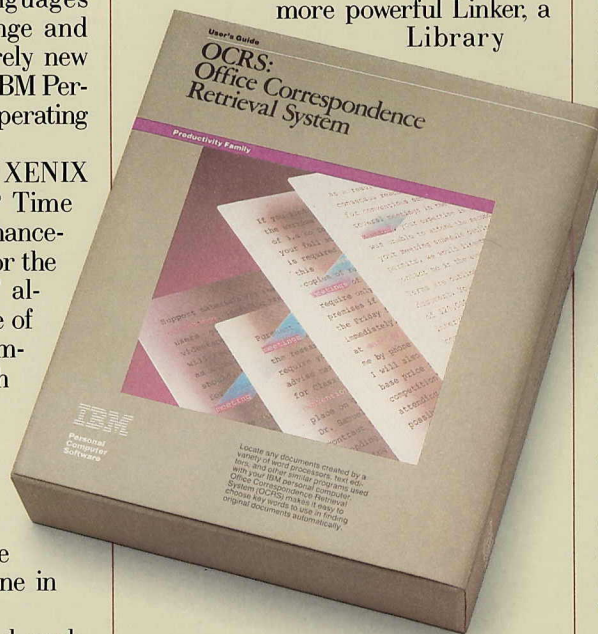
There are two additional packages available to be used with the IBM Personal Computer XENIX operating system that deserve special mention. First, the IBM Personal Computer XENIX Software Development System gives you tools to generate code suitable for either XENIX or IBM Disk Operating System (DOS) operat-

ing environments. Second, there's an IBM Personal Computer XENIX Text Formatting System that can help simplify the production of technical reports, memoranda, formal papers, and documentation—it's especially useful for publications that require technical or scientific formats.

IBM DOS has been updated twice recently. DOS 3.0 provides all the functions contained in DOS 2.1 plus enhancements to support the IBM Personal Computer AT. DOS 3.1 incorporates further enhancements that support the IBM Personal Computer Network.

There are also new versions of the IBM BASIC Interpreter and of the IBM Macro Assembler. BASIC 3.0 contains several noteworthy new functions that provide access to user-installed device drivers. They are: SHELL, IOCTL and IOCTL\$, ERDEV and ERDEV\$, and ENVIRON and ENVIRON\$.

The recent 2.0 version of the IBM Macro Assembler supports both the 8088 and 80286 processors and the 8087 and 80287 Math Co-processors. Other additions include a new more powerful Linker, a Library



Office Correspondence Retrieval System Software from IBM

Manager, and a Structured Assembler Language Preprocessor. And you can use the IBM Professional Debug Facility to put the finishing touches on your assembler language programs.

See your authorized IBM Personal Computer dealer or IBM Product Center about an economical trade-up from your 3.0 version of IBM DOS to version 3.1 or from Macro Assembler version 1.0 to 2.0.

WordStar is a registered trademark of MicroPro. XENIX is a registered trademark of Microsoft Corporation. UNIX is a registered trademark of AT&T's Bell Laboratories.



BUDDING USER GROUPS

Getting started. Ever considered forming a group to exchange ideas about using your IBM Personal Computer, but never got around to sorting out all the start-up details? Or, once past that first stage, does your group find it difficult to come up with new information, presentation materials, and connections with other groups?

Help is at hand.

Because of the growing interest in PC user groups all across the country, IBM has expanded its efforts to encourage new groups and to support existing ones. There's no charge for this assistance, and all groups—whether they have 10 or 1,000 members—are eligible for the same basic level of support.

For starters, the IBM User Group Support department will provide a package that introduces you to some of the basics of organizing a club. It includes a sample constitution and bylaws, suggestions for officers' titles and duties, and a list of other groups already in the program.

Staying started. Once the initial burst of enthusiasm is past, a PC user group needs more than a common interest to maintain its membership—it needs some focus for that interest. IBM can provide information and materials to help keep your group going.

Perhaps the most impressive

form of support is a monthly newsletter on diskette, complete with color and sound. It includes reviews of new products, editorial commentary, and technical tips. The newsletter also carries reprints of the best articles from participating group newsletters, so you can follow the activities of other user groups around the country.

Other sources of useful information are the PC User Group Phone Line and PC User Group Bulletin Board System. You can use the phone line to get answers to questions about the organization and functions of a user group and to find out about other groups in your area.

The bulletin board, which can be accessed through your IBM Personal Computer, carries new production information from the day of announcement. It also provides a means of communicating with other PC clubs.

Finally, to provide topics of interest for your regularly scheduled meetings, IBM will send timely presentation and demonstration materials. Better still, group officers can use the phone line to request guest speakers from IBM for special meetings.*

For more information about participating in the IBM User Group Support program, please write to: IBM User Group Support, IBM Corporation 2900, P.O. Box 3022, Boca Raton, FL 33432.

*The availability and frequency of guest speakers depend on the size of the group, its location, and meeting night.

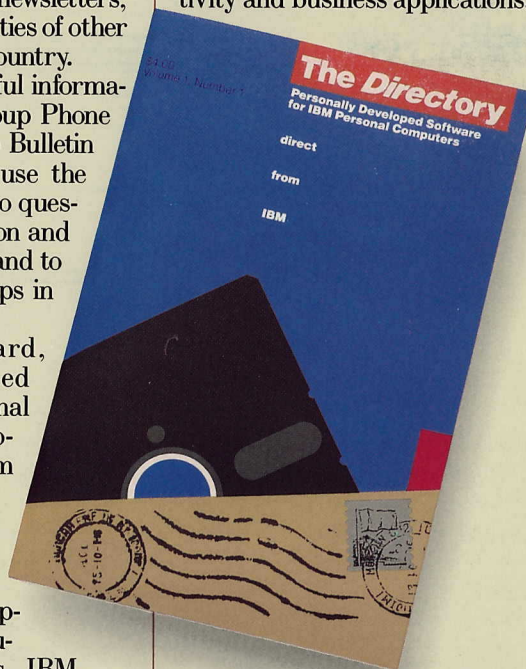


HARDCOPY

Hidden talent. Think of the many entertaining and useful programming ideas that must exist out there but never find their way to market.

The IBM *Directory* of Personally Developed Software gives you direct access to some of that hidden talent. It's a catalog of new programs developed by individuals for the IBM Personal Computer Family.

The best news is the prices. Programs listed in the *Directory* sell for as little as \$14.95. They cover a wide range of interests, from entertainment and education to personal productivity and business applications.



The Directory of Personally Developed Software from IBM

Each program in the *Directory* has a full description that includes system requirements and illustrations or color photos of representative screens. Programs may be ordered by mail or through an 800 telephone number.

To subscribe to the *Directory* call 800-IBM-PCSW.

IBM®



TIPS AND TECHNIQUES

Added color. Bored with the black screen that appears on your IBM PC Color Display when you boot up your system? There are lots of other color possibilities, and the brief program below shows you how to set them from DOS.

It will give you a display with a black border around a rectangle 80 columns wide and 25 lines high. The program can be used in an AUTO-EXEC. BAT file to produce a starting color, and DEBUG will maintain the color you set.

All you have to do is substitute number or letter values for the colors you want where the ?? appear in the following program. For the first ?, substitute one digit (0-7) for the background color. For the second ?, substitute either a digit or a letter for the foreground color (1-7 for regular colors, 9-F for intensified colors). For example, 28 will give you grey text on a green background. For a complete listing of the color codes, see the Color Statement section of your IBM BASIC manual.

To set your screen colors, do the following from the DOS prompt:

```
A>debug color.com
File not found (ignore this message)
-rcx
:20
-e 100 2b c0 le 50 b8 03 00 cd 10 b8
00 06 b9 00 00 ba
-e 110 50 20 b7 ?? cd 10 b4 02 ba 00
00 b7 00 cd 10 cb
-w
writing 20 bytes
-q
```

Thereafter, you need only type "color" at the initial DOS prompt after booting your system to change the display from black and white to your preset colors.

For more information about IBM Personal Computer products discussed in this issue of *Read Only*, see your authorized IBM Personal Computer dealer or IBM Product Center. To learn where, call 800-447-4700. In Alaska and Hawaii, 800-447-0890.

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The New Technophobia

A challenge to the opposition to think again

by Jerry Pournelle

One's enemies change. When the micro revolution began, most opponents were managers of large centralized computing establishments. Distributed computing was their enemy, and they knew it.

That battle has largely been won—and much quicker than I thought it would be.

Now there's a new enemy.

There have always been theorists to denounce computers in the name of "the poor." Now they're multiplying. Mr. Stewart Brand's financially ailing *CoEvolution Quarterly*, saved from bankruptcy by Doubleday's \$1.4 million advance for the *Whole Earth Software Catalog*, has been combined into one magazine with the *Whole Earth Software Review*; the first issue of the resulting *Whole Earth Review* is entitled "Computers As Poison."

Mr. Brand offers as explanation: "In criticizing some of the effects of computers are we—all of us—biting the hand that feeds us? Oh yes. But the hand, also, is food." I'm not sure what that means, but it sounds clever. Brand has done us one favor. To find

that many arguments against computers I'd have had to search dozens of publications, most of them badly written and boring. Brand has got them all into one place—and edited them into near readability in the bargain.

It may very well be that Brand believes that by publishing all the negative voices in the micro revolution, he'll stimulate discussion. I'm willing to pick up the gauntlet in this noble duel although I can't believe

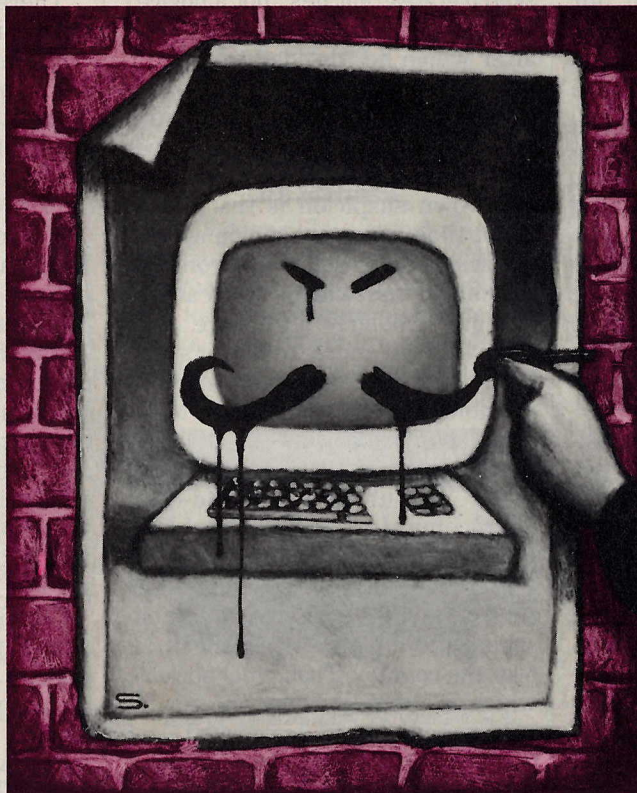
that this collection actually serves to help us strike a balance between hype and truth.

There is Art Kleiner, who confesses ambivalence toward the micro revolution; one of his major points is that by watching text come onto his screen from the network he's connected to, he has raised his reading speed from 30 characters per second to 120. If you accept that an English word has 6 characters (5 letters plus a space) this means he is unhappy because he formerly read 300 words a minute and now reads 1200, with the result that when he reads a book he must consciously slow down so that his thoughts catch up. Poor baby.

High Tech or Low Tech?

The comprehensible arguments against the micro revolution clump into two related categories: economic effects and social-political effects.

Both arguments are presented by Langdon Winner in an essay on "Myth-information"—a term he defines as "the almost religious conviction that a widespread adoption of computers and communications systems, along with broad access to electronic information, will automatically produce a



better world for humanity. Winner "teaches political theory—especially on the relationship between politics and technology—at the University of California at Santa Cruz."

Of course, if Winner's goal is to refute the position he describes, then by me he has won his case. I don't think that computers—or anything else—will "automatically" produce a better world for humanity. The idea of inevitable progress, formulated by the German philosopher Hegel, was adopted by Karl Marx and has been since 1917 the justification for Soviet tyranny. "We're the party of progress. You're not against progress, are you?" The American tradition was expressed by Benjamin Franklin after the Constitutional Convention: when asked if the Convention had given us a monarchy or a republic, he replied "A Republic—if you can keep it." In this country we have long known that eternal vigilance is the price of liberty.

Winner, however, doesn't argue that the micro revolution—like any other time of great change—generates an especial need for vigilance and skill. He condemns computers out of hand.

He's even concerned that they're going to make "solipsists" of us all; computers are making us turn inward, making us utterly self-reliant, killing "the sense of sociability and public concern." A few of us who remember David Riesman's fears find that amusing. Riesman's classic study *The Lonely Crowd* (1950) voiced the concern that everyone had become "other directed" and no longer had self-reliance.

Winner begins with the proposition that computers won't be any use because most of the jobs they create "will be menial service positions paying relatively low wages. As robots and computer software absorb an increasing share of factory and office tasks, the 'information society' will offer plenty of work for janitors, hospital orderlies, and fast-

food helpers."

The interesting part is that only a few years ago the computer revolution was condemned because it created *only* high-tech jobs requiring high intelligence and years of education and thus wouldn't be relevant to most of us. One would think that Winner would rejoice to find that the micro revolution will create jobs for people who don't like and won't use computers; but no.

Second, he says, computers won't help ordinary people at all. The institutions best able to make use of computers are "large trans-national business corporations," followed by "public bureaucracies, intelligence agencies, and ever-expanding military organizations."

I would have thought that true only so long as computers were huge "hulking giants" hidden in clean rooms and served by white-coated high priests; it's clearly not true of micros, which can multiply the ability of ordinary citizens to collect, manipulate, store, process, and understand all kinds of information.

Professor Winner's biographical sketch states that he's "not a novice." He has used computers for one year, after which he "decided to read up on the scholarly and popular literature on computers and societies." "Mythinformation" was his first response.

My own suspicion is that if he'd spent time *using* the machines and participating in some electronic information networks instead of reading scholarly literature, he'd have learned more. While it's certainly true that computers make it possible for large institutions to accumulate more power—the ability to collect and manipulate dossiers must never be underestimated—the microcomputer distributes that power to others.

I can, with a single telephone call, send a message to literally thousands of computer enthusiasts all over the country. That's real power—which is precisely why the Soviet government is so concerned lest microcomputers get loose among their subject peoples. If information

is not power, why do tyrannies spend so much time and effort to suppress its dissemination?

Ye Shall Know the Truth . . .

Of course Winner explicitly rejects the proposition that knowledge is power. Even if people have information, it won't do them any good. The idea that knowledge and literacy are of unquestionable social value is, Winner says, "entirely faulty. It mistakes sheer supply of information for an educated ability to gain knowledge and act effectively. Even highly developed societies contain chronic inequalities in the distribution of education and intellectual skills. The U.S. Army must reject many of the young men and women it recruits because they cannot read military manuals."

I suppose the implications are plain. Since most people cannot make use of information, there is no point in letting them have it. Decisions will be made by an elite that is able to "gain information and act effectively"; presumably Winner and his friends?

There is an alternative. John Adams identified it long ago: we may consider each citizen the best judge of his own interest, or we may appoint someone else to make that determination. The United States was founded on the former proposition.

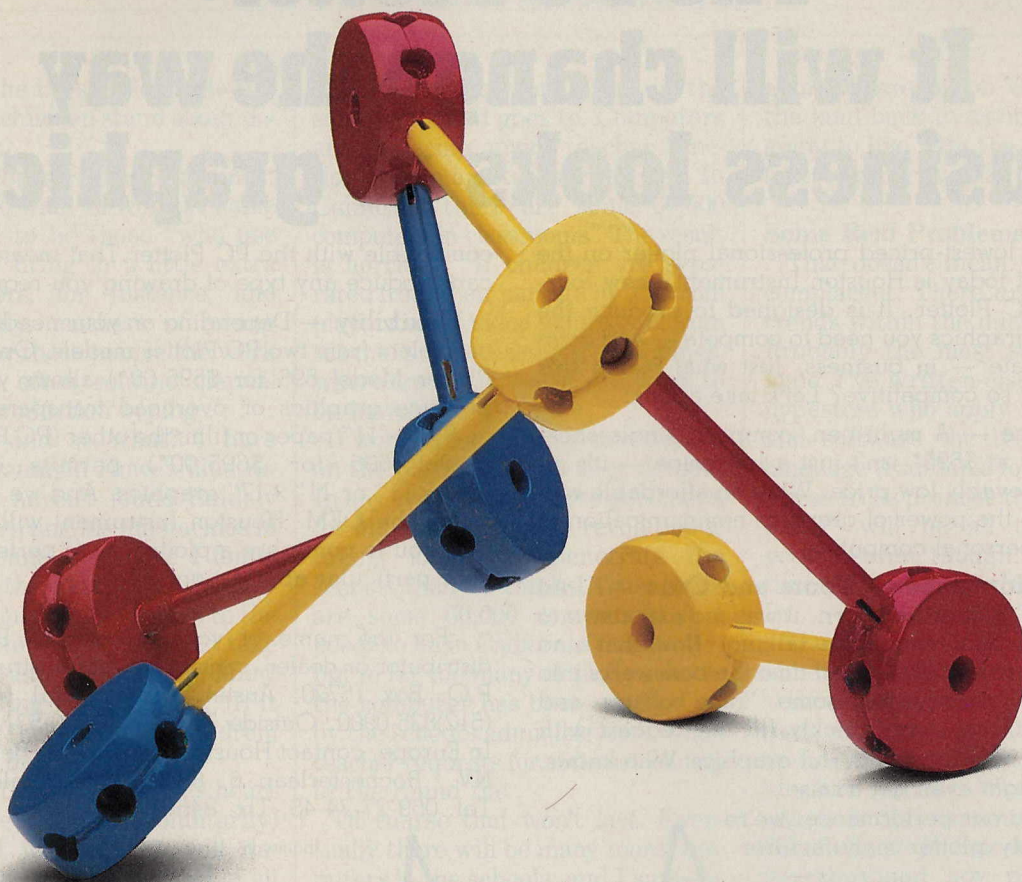
If knowledge isn't power, then is ignorance bliss?

Housebound

Another lament Brand thought worth publishing is "Housebound" by Joan Howe. Howe is described as a senior programmer who "rides the big ones—IBM mainframes." Her thesis is simple: small computers will enslave women by forcing them to work in the home. (Evidently she doesn't feel enslaved by IBM.)

"Housebound" is illustrated: a single picture thought important enough to repeat four times shows an aproned, squinting, and plump woman typing into a personal computer. A wall clock shows 10 minutes to 7. The woman's right leg is

Science fiction writer Jerry Pournelle, who joined the micro revolution eight years ago, is a contributing editor of *Popular Computing*.



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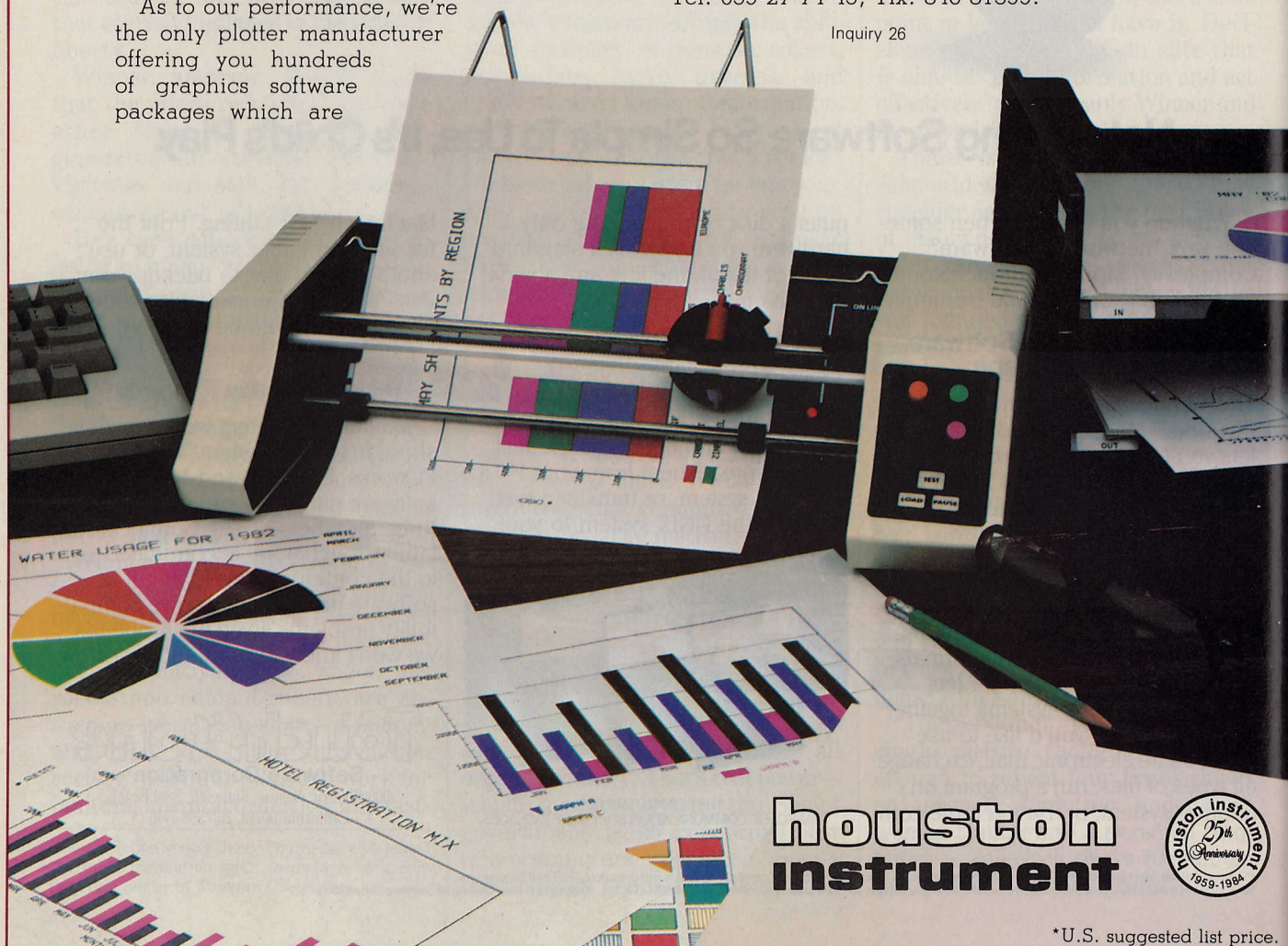
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chained to the PC's table, while two blank-faced children stand about doing nothing.

Howe is concerned because most of those who want to work at home "are likely" to be those "who use telework to bring in a little extra cash—farmers, for instance, and most notably, mothers of young children. For these people the work available is often routine clerical work and production typing . . ."

All true—and so what? I have minutely examined Howe's illustration, and I haven't found Snidely Whiplash twirling his mustachios in the background—nor have I found any clue to the identity of the person who manacled the woman to the computer. No one is *forced* to take a home job; and as my friend Mary said on reading Howe's essay, "If it isn't mother there with the children, who *will* it be?"

I suspect that when Howe's heart ceases to bleed for the (voluntarily) housebound woman, she will demand that we do something about all those latchkey kids. There's no pleasing some people.

Grave Doubts

Finally we have Jerry Mander, author of *Four Arguments for the Elimination of Television*. Mander is a senior fellow at a nonprofit advertising agency and the author of a forthcoming Sierra Club book. He has "Six Grave Doubts About Computers."

The only thing that would satisfy Mander would be to stuff the electronics genie back in the bottle. His arguments apply to *all* computers, mainframe, mini, and micro alike.

One was given above: computers are now being used in camp and forest management, thus isolating us further from nature. On that score I have good news: because my computer makes it possible to turn out my books faster, I have more time to take the Boy Scouts into the High Sierra, where we escape from electronics and microwaves and the only hazards are steep cliffs, high altitudes, and bears.

Mander is also concerned about

"the takeover of computers in the school your kid goes to. Computers are replacing many teacher functions, and many teachers as well. In California there are some 60,000 computers in classrooms." The result is horrible: "If children are separated from their parents by TV, from playmates by video games, and from teachers by teaching machines, where are they supposed to learn to be human?"

I would have thought they'd learn on the playground, as they do now. In any event, I have more good news for Mander. The micro revolution is taking longer to penetrate the schools than he thinks. True: there are some 60,000 computers *supposed* to be in California classrooms; but in far too many of those schools the computer has been snaffled off by the school's administrators, while teacher requests for software end up in the round file.

Of course that won't last. Eventually there will be many more computers in the schools; and I suppose that bad teachers will use them to isolate the children. It's hardly a new phenomenon; it began with workbooks, which can be used by lazy teachers to keep the children busy. Good teachers will make good use of new tools; bad ones will misuse them. When was it ever different?

Who's Complaining?

There's a lot more of this sort of thing in Brand's magazine; it's all written by highly educated people with professional employment. Now sure: most published material *is* written by professionals, but I find it interesting that in the entire "Computers As Poison" issue of *Whole Earth Review* there's not one single quote from the people actually affected by the machines.

Without question, technology can be used badly. Anything can be, and so what? We are *not* going to invent time machines that allow us to go back in time and murder Marconi, de Forest, Edison, von Neumann, Babage, Shockley, Rutherford, and all the others who contributed to the discovery of electronics. We are *not*

going to raze Silicon Valley and turn the land back to agriculture. We're going to live with the micro revolution whether we like it or not.

Some Real Problems

That doesn't mean we should be complacent. There *are* some bleak trends within the micro revolution. Probably the most serious is the hype. I've written elsewhere about hypsters who apply to computers and software the techniques and language traditional for selling soap. These trolls promise that their "products" will be all things to all people—even though much of the time the "product" doesn't even exist.

The danger here is that newcomers to the micro scene may believe the promises. Should we not, then, move to protect them? I have the horrible suspicion that is precisely what Mander, Winner, and the others in the current issue of the *Whole Earth Review* want; and *that* frightens me.

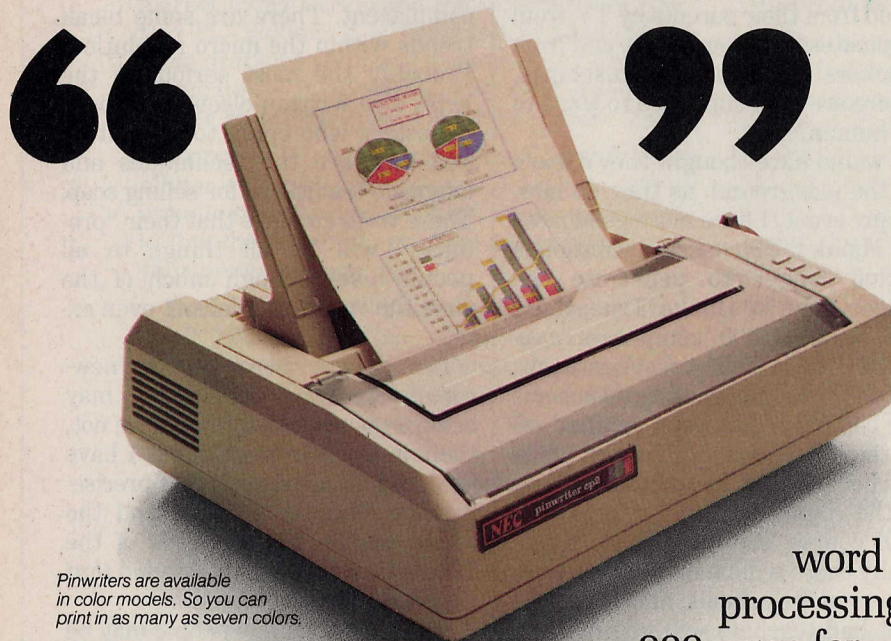
Sure, some gullible people may be victimized. That's a pity. Even so, it's not all that serious a danger, and in any event the remedy is obvious: when people learn about microcomputers, they'll be able rationally to evaluate the promises made by the product snatchers.

I suspect that much of the concern for "the ignorant and gullible" is ill-concealed elitism to begin with. I won't fall for such foolish arguments, but other people might, so I'd better rush out and protect them . . . On such arguments are bureaucratic monstrosities built.

For my part, I prefer Jefferson: "I know no safe depository of the ultimate powers of the society but the people themselves; and if we think them not enlightened enough to exercise their control with a wholesome discretion, the remedy is not to take it from them, but to inform their discretion." □

Jerry Pournelle welcomes comments from members of the micro revolution. Write to him *c/o Popular Computer*, POB 397, Hancock, NH 03449. Jerry tries to answer all his mail but cannot promise individual replies.

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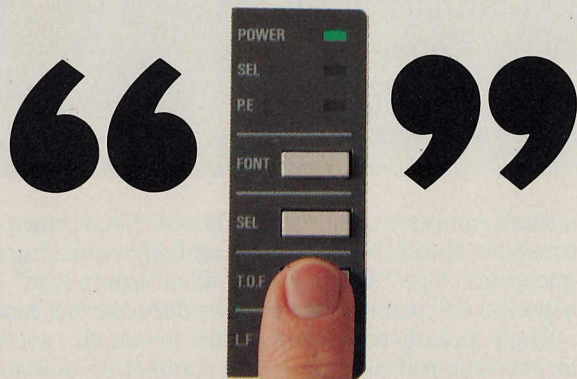
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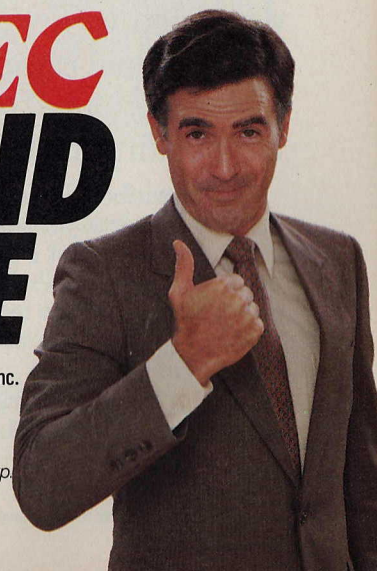
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THE DREAM MACHINE

A quest for the ultimate computer

COVER STORY

by Paul Freiberger

For some time I had sensed the ideal computer out there—a computer that would let me manipulate the universe with a wink and a nod. It lay just beyond the edge of my mind, and it demanded my attention. I began talking to experts, and they fed my enthusiasm. My search intensified, became a quest of almost medieval nature, as though I were looking for the Holy Grail without even knowing what it was. A surprising number of people refused to talk to me, perhaps fearing they might reveal commercially valuable ideas. But others found the topic as compelling as I did. And ultimately the quest led to many engrossing minds: from the founders of the personal computer revolution, to the creator of *Star Trek*, and eventually to Ted Nelson, a man who already seems to be working in the twenty-first century.

They described numerous dream computers, different in many respects, yet basically similar. None of their visions were mine, but I used them in conceiving my own miracle machine, the way some people use the theories of Freud and others to divine their inmost natures.

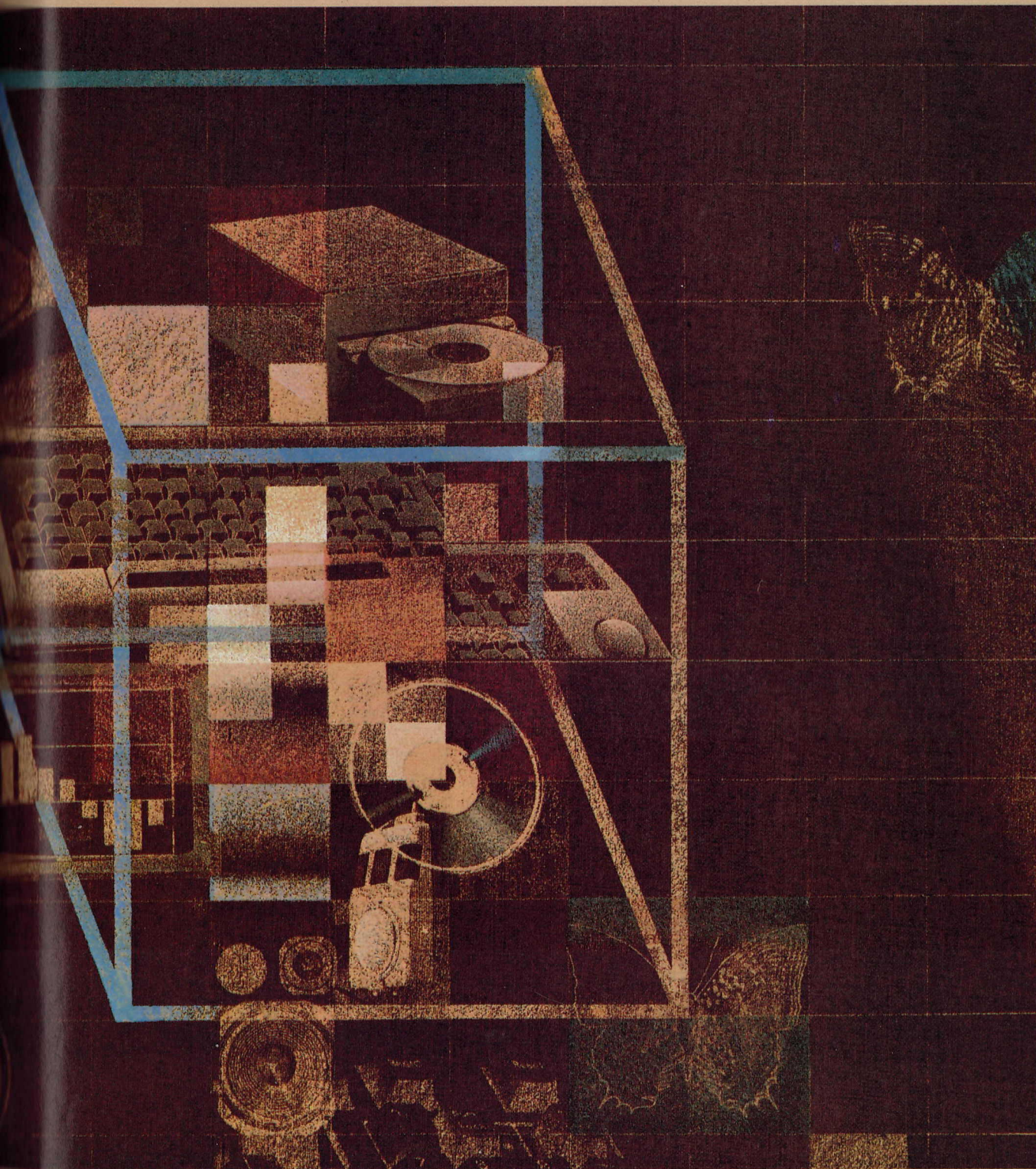
The Basic Vision

I first visited two friends of mine, PierLuigi Zappacosta and Giacomo Marini, executives with Logitec,

a small company that makes state-of-the-art mice. Both consider themselves humanists and enjoy thinking about questions like “what is the ideal computer?” Over espresso and pastries, we discussed the perfect machine.

Their dream computer would be small, not much larger than a desk phone, and completely portable, so you could do editing on a plane. “The machine should be such,” said Marini, “that when you connect it to the phone, you are connected to the rest of the world.” It





would surmount three basic barriers: capacity, speed, and graphics resolution. It would also have a mouse, a device they, of course, favor strongly. The two stressed modularity in both hardware and software. "So far, software is at the stage of the gramophone," says Zappacosta. "Even with the best-selling packages, no one is really happy." People should be able to put software units together to suit their needs. Expert systems should also find a ready market, in part to supplement

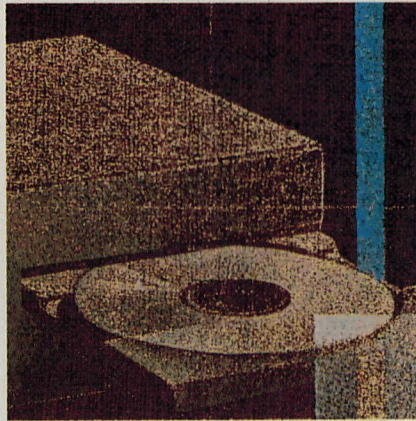
the efforts of mechanics and other fallible artisans.

Zappacosta and Marini were fascinated by the possibilities, yet cautious in their vision. And in this way they were representative of many individuals I spoke to. Their vision was solid: greater memory, speed, and screen resolution were all desirable. Portability and

Paul Freiberger is a West Coast editor for *Popular Computing* and coauthor of *Fire in the Valley: The Making of the Personal Computer* (Osborne/McGraw-Hill, 1984).

modularity were commonly mentioned. Some also noted the importance of communications, comprehension of human language, and "mutable" software that could automatically adapt to your work pattern.

These ideas were sound and helped me along considerably. But when searching for utopia, you tend to latch upon the most specific, the best-developed of constructs. So too, in my quest I was looking for fully rounded visions of the complete computer, unconstrained by the limits of today, tomorrow, or even the next day. I found several. One such vision came from a man who has made a career of the futuristic.



THE VIDEO SLATE

GENE RODENBERRY first became interested in technology as a youth, when he wanted to be an airline captain. He later went on to be the creator and producer of *Star Trek*, the well-known TV series.

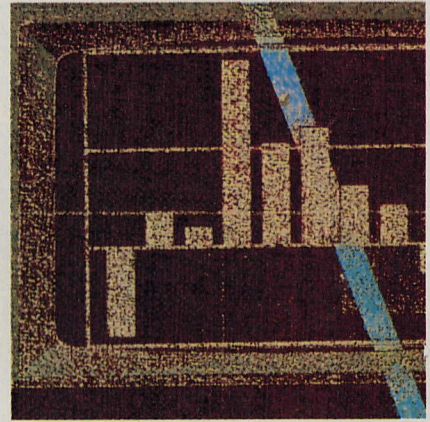
"The computer is a primal invention on the same order as fire," he says. On his first *Star Trek* episode, he showed a computer he would still like to see. It was a slate. Press a few buttons, and the text of the book you selected would appear on it. If a database contained enough books, you could use the slate to read anything ever printed. The slate could also display movies, TV—anything with images and sound.

Rodenberry believes people will become less and less aware that they are using a computer because of its streamlined design and general ubiquity. "Computer lingo will go away like early automobile terms," he says. "How many people today know what a choke is?" The computer will control our homes, taking care of recipes, word processing, burglar alarms, and numerous other tasks.

Nonetheless, he admits that sci-fi television did not give him total freedom to conjecture. "On *Star Trek* I had to hold back," he says, "because on things like a hand-held communicator—though I knew we'd get the

circuitry down to the size of the head of a pin—people wouldn't have believed Kirk speaking to such a small device."

Rodenberry's portable video slate was an idea I would hear echoed later by others. Since it seemed so desirable, I thought I would talk to an individual who, I knew, favored just the opposite: a wall of video spread out before him like a buffet.



THE CAPE CANAVERAL CONSOLE

HARRY SOL IS PRESIDENT of Nestar, a maker of networks. He is a friendly, open individual with an air of the professor but with no trace of the pedant. He says he was a hacker as early as 1958 and has thought a great deal about the ideal computer. "It's always in the unconscious corners of my mind," he says.

His computer will boast a "Cape Canaveral console," that is, five or six separate screens, perhaps two on the top and three on the bottom, totaling between 6 and 10 square feet of display unit. He can then do several tasks at once. On one screen, he might receive electronic mail, while a second shows a spreadsheet, and a third a word-processing document. The screens will have high-resolution color, and the whole arrangement will require "vast amounts of real memory" and "significantly faster processors than we have today."

One keyboard will manage all this display, but it will be a special one. It will have from 16 to 24 function keys, and the legends won't be engraved "F1," "F2," and so forth, but rather programmed, illuminated keys so the user can change them at will. In addition, foot pedals, similar to those on a baby grand, will act as extra shift keys. A trackball, rather than a mouse, will further augment ease of use. Moreover, the keyboard will slide under a shelf to expose a flat, blotter-sized display, on which you can use a light pen or stylus to edit and move sentences around.

Not surprisingly, Sol sets no great store on portability-

ty. "I don't see a need for making this mobile," he says. "I feel real comfortable doing my work pretty much in one place."

Sol does want software systems that respond to his patterns of use. For instance, if he has a whole library of programs, and he uses a certain word processor regularly, the system should be clever enough to keep it loaded in memory. If he then begins doing graphics, the system should adjust the files to this task. "It should be aware of what I'm up to and optimize its behavior for me."

He would also like more expert systems, as well as software that recognizes human language and does moving video.

"I don't think anything I've said couldn't be done in the next decade," he says. "Probably in a decade if I come back and look at this, I'll be faulted for having set my sights too low."

By now, I had found two apparent areas of disagreement: portability and tactile input device—mouse, trackball, or stylus. I decided to call up a man who, I felt, would have firm ideas about tactile input devices.



THE COMPUTER-IN-A-CLOSET

STEVE GIBSON INVENTED the Gibson Light Pen. A runner, skier, and lover of gourmet food, he has been interested in electronics as far back as he can remember. His family has photos of him playing with batteries at the age of three.

"The light pen taught me there is no substitute for interacting with the image itself," he says. "I mean physically touching it." A touch screen of some kind is superior even to voice, because it's faster to point than to describe. However, he is not opposed to mice and the other contenders. "Ideally, I don't think there is one best answer," he says. "I don't think restricting the dimensions of a user's interaction is something a future machine will do."

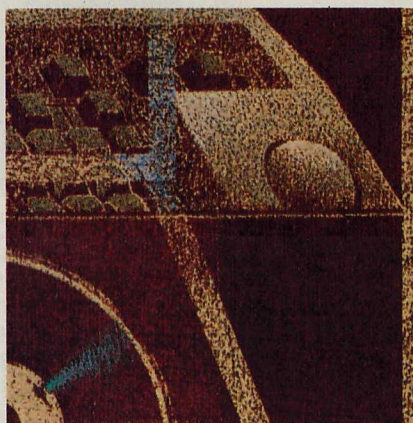
Gibson imagines a residential computer kept in a

closet. Family members would have high-resolution color display panels and keyboards, which would be wireless and portable, so people could walk around the house with them. These touch-sensitive terminals would also be connected to multiple phone lines. "So you have the terminal at your side," he says, "and when a thought occurs, right then you send it, even if the recipient is on a business trip to Dallas. It will find his terminal in Dallas."

Gibson waxes enthusiastic about expert systems, for which the read-only laserdisc has great potential. "The entire how-to genre can be put on an optical disc and provide a whole new experience for the consumer," he says. He also looks forward to receiving software through antennas, at which point "software becomes less static, and there's no reason why software can't update itself." Basically, he says, "The software is never done. I want HAL."

Gibson favors prepackaging over modularity. "Modularity just doesn't seem to be working," he says. "There are too many decisions for the consumer to make, too many pitfalls. There is a problem with so many companies providing a piece of the solution. One significant company—and we haven't seen this yet—has to do the whole job."

This opinion was unusual and provocative. It spurred me to visit one of modularity's leading exponents, a pioneer of the personal computer movement who has long enjoyed a reputation for wit, sagacity, and technological populism.



THE MODULARITY MODEL

LEE FELSENSTEIN not only designed the Sol, the portable Osborne 1, and numerous peripherals, including the Penny Whistle modem, but also helped catalyze the industry in Silicon Valley in the middle and late '70s. Sometimes called the Johnny Carson of Homebrew—the influential early computer club where he acted as toastmaster—Felsenstein



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can be counted on to speak with wry insight.

"I would say that I know that I don't know what the dream machine would be," he said. "But I know how we can find out." Modularity is the magic key. The computer's baseline design will have a minimum of hardware, somewhat along the Macintosh line. This nucleus will then go before the public. It will be there "to collect, like ants around honey, the developers or would-be developers of software and hardware add-ons." A "public bazaar of technology" will take place, and in about two years, a winning combination or set of combinations should emerge.

Beyond methodology, Felsenstein has several concrete ideas for the ideal computer. He would like a keyboard detachable into halves, so each could sit on the armrest of a chair. "The idea of having to hunch over a keyboard because the keyboard is there is a relic from mechanical typewriters," he says. "The keyboard should be where your hands are." He is also intrigued by cordless keyboards and dynamically reassignable keys. "It'll be nice to have liquid crystal keycaps with little matrix displays in them," he says.

He favors mice, though he thinks they can be much improved. A superior device according to Felsenstein, is a pressure-sensitive joystick on the side of the keyboard, called a "nudger." Already used by the military, the nudger moves the pointer in the direction you push it and at a speed that corresponds to the amount of pressure you assert.

Felsenstein wants screens with color and continuous zoom and pan. Panning gives two dimensions to a display, he says, and zoom adds a third. "We want to be able to push the picture around by expressing our intention to do that, find what we're looking for, get what we're looking for, and be able to pull back if we lose it and take a global view." Good display-managing software is vital. Moreover, shaded pixels with a half-intensity gray, which render curves very well, are desirable.

The printer will evolve into a versatile item indeed. The laser printer, he says, can fairly easily be printer, office copier, and optical scanner, all in one. "We will see this in a short time," he noted. "The laser printers are merely modified office copiers, and there are various scanning devices that are not complex."

His dream machine requires a modem, "because as far as I'm concerned, the purpose of computers is communications." In fact, the telephone will gradually merge into the personal computer. "It's not a difficult technical task," he says. "If you've got a modem and you have the means of hooking to the line, all that's lacking is a handset."

With software, Felsenstein would like to "make a bridge between everyday applications and video-game operations." He says people learn video games by simply tackling them, and they enjoy it. They should learn more humdrum programs in a similar way. "I want to bring the fun into the everyday applications, and I want to enable people to learn them by the seat of their pants," he says.

However, he is skeptical about expert systems, main-

ly because he thinks people should know something about the "experts" who prescribe to them. "If you don't know where the information is coming from, who put it there, why it's there, then you're setting yourself up to be a tool in somebody else's hands," he says.

His comments on expert systems raised a point. So far, I had been speaking mainly to hardware people. I decided to find a software expert and wound up talking to another founder of the personal computer revolution.



THE DISAPPEARING COMPUTER

ALAN COOPER HELPED start one of the first micro software companies, Structured Systems Group, in 1975. I spoke to him by the swimming pool of his home in Atherton, California. Cooper enjoys expressing strong opinions and says that sometimes he loves programming, other times he hates it. He is a gourmet cook and a pilot, and his latest hobby is the electric train he set up in his garage.

"The computer should almost disappear," he says. The trend from room-sized monsters to desktop boxes should continue even further. "We'll end up with an I/O device: a screen and a keyboard and a place to plug in these little memory cartridges." A mouse—"the best form of pointing input device"—will also be available.

Disks will recede greatly in importance. "Disks have only one purpose, and that's physically transferring information from one computer to another," he says. We use them as storage because they are cheap, not because they are efficient. "In an ideal world, you don't need backup," he adds, referring to the vulnerability of disks to sunlight, magnetism, and other natural phenomena.

Cooper's dream machine will control numerous household functions, such as drawing a bath, tuning the TV, or starting the coffee in the morning. "Say I'm at work and I invite you to dinner," he says. "I call my computer at home and say to it, 'Guest coming at 7 p.m.' At 6 p.m., it airs out the guest room. It turns on the lights around

the house and prepares the house for the guest. That's what I'd like to see: the computer talking to electro-mechanical devices."

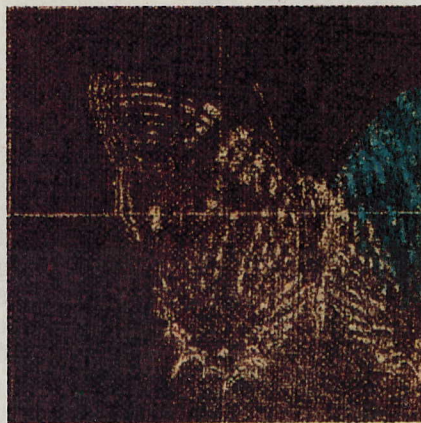
Cooper's computer will also be heavily phone oriented. "When someone calls, I'd like my computer to flash in the corner of the screen the name of the person who is calling," he says. The machine will have its own phone number, for electronic mail, and this feature, combined with cellular telephony, will make the machine a superb communications instrument.

"If you've packed your computer and moved," he says, "I can still call your computer and get to this cellular network that will find you."

The amount and quality of software for various computers will determine which ultimately succeed, he observed. But one feature is definitely on the way out: on-line help. "It's too expensive and not useful enough," he says. "There are more effective alternatives, and the easiest one is to make your programs easy to understand." The Macintosh software, he pointed out, has no on-line help at all.

Cooper concluded with a warning against rote imitation of the ground-breaking ideas of the past. "The work of most brilliant people is an arrow in a direction that was previously unseen," he says. "As practitioners, we should follow that arrow, not worship it. We can do better."

It was an apt prelude to the final person I spoke to about the ideal computer.



THE FAR-HORIZON MACHINE

TED NELSON WROTE the 1974 book *Computer Lib* and is well known for technological foresight. Nelson is a likable individual who projects an agreeable air of being on stage, and he not only gives the impression that he is about to say something clever or memorable, but he usually does.

Nelson described at least two dream machines. "In

THE BEST NEW SOFTWARE WILL SOON COME FROM MOVIEMAKERS, NOT PROGRAMMERS, SAYS NELSON

each generation," he says, "the ideal computer will be the one that is just out of reach." He talked about his notion of the machine around the bend, as well as the computer that may not be so imminent.

His "low-horizon dream machine" is a pleasing device not unlike Harry Sol's. "I just want a bar carouser," he says, "with my feet up, the keyboard in my lap, the monitor hovering over me, and a rotary file at my right giving me a large filing area I can reach out to." He would also like multiple visualizations, larger screens, 4-D graphics rotation, more memory and speed, and the software to use these things efficiently.

But Nelson's imagination gravitates naturally to the larger scenario, freed from the baggage of next-day feasibility.

One of his main concerns involves the comprehensibility of the computer to the public. He points to the Macintosh ad which claims that, till now, only 10 percent of the world could use a computer and that the Macintosh is the machine for the rest of us. "That part isn't true," he says. "The Macintosh extends it down to the top 20 percent, or some such figure. I contend that if we had good and clear software, we could bring it down so that at least 60 or 70 percent of the population could use computers."

As an example, he cites the spreadsheet. In order to see the master plan of a particular spreadsheet, you have to look at each cell and take note of the formula embedded in it. Instead, he says, there should be some way to make the conceptual framework instantly clear, as by "zooming red arrows" or some other overlay. Such a feature would condense and clarify the program's structure, making it more pleasant to use and widely accessible.

Software should also be more entertaining. "Certainly we need people with more visual imagination, people with a greater sense of theater, people with a greater sense of art." For this reason, he says, the best new software will soon be coming from the moviemakers rather than the current programmers.

One of Nelson's basic contentions about existing software is that it is too parochial. Specific applications, such

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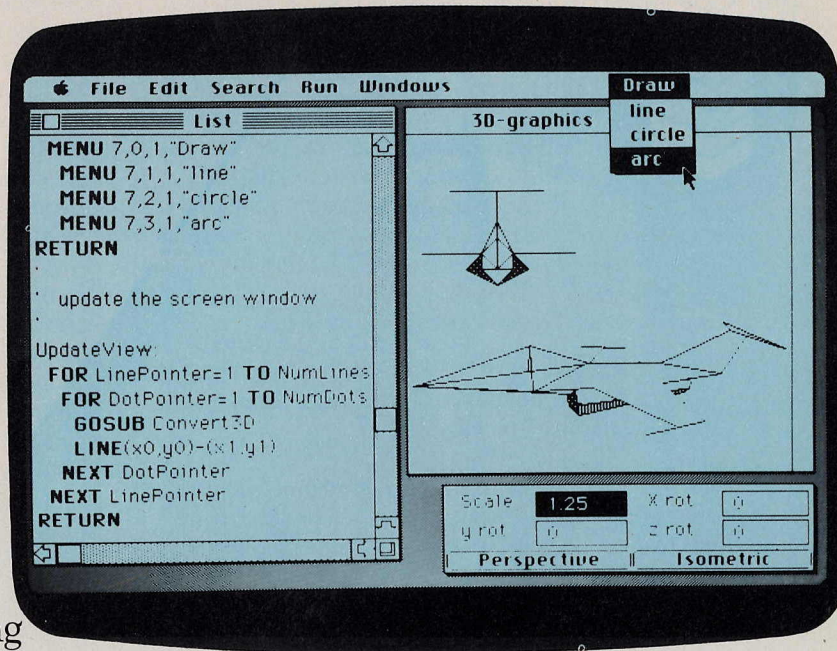
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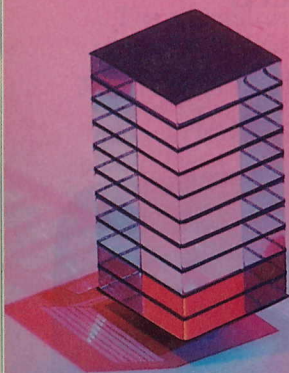
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BABIES WITH CRIB COMPUTERS MAY BE ABLE TO SURROUND THEMSELVES WITH A "SONIC FOREST."

as databases, tend to solve problems in locally simple ways that may, upon future expansion, create needless large-scale complexity. They are evolving independently, on divergent courses, and more farsighted goals—like complete integration—may become almost unmanageable with current models. Nelson had an integrated package as early as 1978 and remains a champion of what he calls "global designs." And he has been working on a master database known as Xanadu for several years.

Xanadu is "the prototype of the storage system of the future" and will contain what he considers critical features missing from current databases. For instance, it will let you mark any portion of any file with a label, so you can establish a link to it at once from outside. It will allow you to treat any existing material as a boilerplate, which you can rearrange into new versions to suit your needs.

"In the year 2050," he says, "there'll be 13 billion people and very few trees, and so virtually all publishing will be electronic." A system like Xanadu will hold such published works and greatly facilitate updating by the author. It would be "a worldwide network of local centers or stands, similar to McDonald's stands." He says he has designed the system so it does not trip over itself, so it can "expand forever without slowing down."

Nelson also favors more interesting input devices. For instance, he envisions input panels that you kick, so you can work and exercise at the same time. "I want to be able to jump around, dance, swing from bars, play, and still have computer input." The fusion of exercise and input could go even further. "I want to see someone build a Walkman-like game that responds to you in stereo, so you grab an imaginary object that zooms by," he says. "You'd get all kinds of exercise, excitement, and points as you jog down the side of the road."

He would also like to see better computers for children, even infants. "Crib computers, for example," he says. Children could perhaps start out by controlling a "sonic forest," that is, multiple voices in a synthesizer, with the capacity to "jump from one sound to another, so that you build this forest of sounds and

wander around in it." He sees this endeavor as the beginning of "multidimensional visualization teaching" in children, that is, "the ability to unite and comprehend and feel complex wholes in whatever modalities they may be."

END OF THE QUEST

I HAD REACHED THE end of my journey through other people's imaginations, but not the end of my quest. Thinkers like Nelson had led me to the brink, but at that point I had to go on myself, use my own imagination.

I ultimately found my dream machine. It is a two-part model. It has a workstation form, and a detachable, portable form, which can be carried anywhere. I'll begin with the most general features. It has low cost; 100 gigabytes of nonvolatile RAM, so mass storage is unnecessary; lightning speed, derived from gallium arsenide chips; and a display with zoom, pan, and color screen resolution so minute that you can't detect the pixels.

The portable version would have a screen of 8½ by 11 inches, an adjacent trim keyboard, a light pen, a cellular modem, and a laser printer-copier-scanner, all weighing about five pounds. It wouldn't have to fit into a briefcase—it would replace the briefcase.

The workstation version would have several page-sized screens that display pages of my document, which I could call up instantly by topic; a large keyboard with programmable functions I could invent myself; a mouse and a touch pad; a modem that could adjust automatically to the other side's settings; a laser printer-copier-scanner; an accurate speech recognition device; the ability to store, edit, and play back any video or audio data, including voicemail, hi-fi music, television, and photographs; compatibility with every program written; the capacity to regulate household activities, particularly to control the robots that will be doing the dishes, polishing my clarinet, and performing other routine chores; and an independent power source, in case of blackouts.

The software for my vision of an ideal computer would exploit all of the above. It would have a very friendly interface; mutability and the capacity to anticipate my needs; true integration that lets me draw directly on a word-processing document or spreadsheet; and plenty of expert systems, so I can choose among experts I know something about.

My dream machine is not a modest machine—after all, it's ideal. But it brought me to the end of the line, and yet my main feeling was that I had not reached the end. I had the sensation of travelers who reach such exotic outposts as Patagonia or Lhasa and find that there is still a horizon beyond which they cannot see. In 10 or 15 years, I might look back on this vision of an ideal computer as quaint. But that's a small enough price to pay for a dream. □

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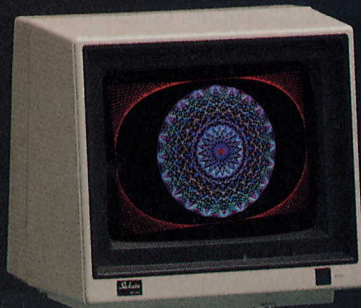
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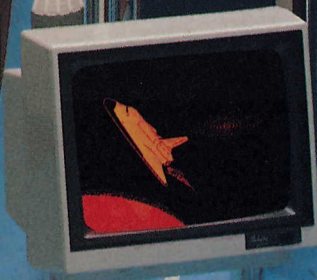
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SCIENTIFIC COMPUTING

Micros are infiltrating science labs, with some noteworthy spin-offs

There's no doubt that the microcomputer has had its biggest effect in the workaday business office. The powerful, easy-to-use little machines, teamed with well-designed software such as electronic spreadsheets, word-processing programs, and database managers, have fundamentally changed the way we do business.

Now, in unexpected and even offbeat ways, something similar is happening in the less-publicized but no less important worlds of science, engineering, and mathematics. And it comes as a surprise, for unlike business managers and executives, researchers are already familiar—even intimate—with powerful mainframes and minicomputers and know how to get what they want from them. You'd expect they would have little use for off-the-shelf micros.

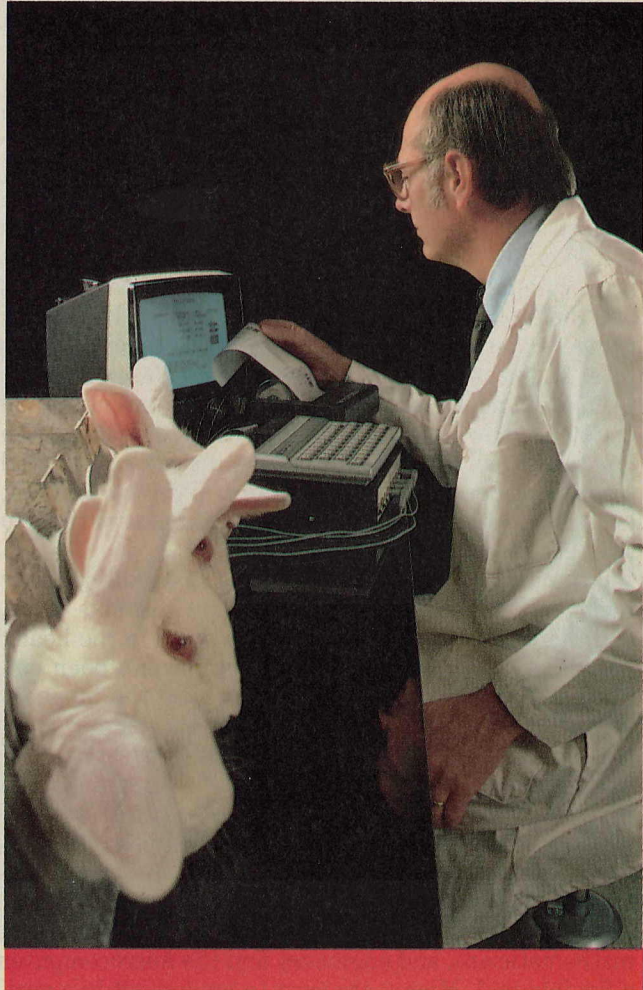
Nonetheless, small personal computers have found important niches in some of the nation's most sophisticated laboratories. This Special Report tells the story of how they claimed that place, what they are being used for, who is using them, and where they are likely to go in the years to come. We'll also take a look at specialized problem-solving software, much of which has trickled down from this rarified environment to the commercial market.

Part One, "Micros in Research," shows how personal computers are proving their worth both in conventional ways to scientists, engineers, and other researchers and in some decidedly unconventional ones.

Part Two, "Specialized Software," looks at a corollary development. Because most business applications involve "business as usual," standard software is able to answer the needs of many, many users. But almost every research project is in some way unique, and commercial development of more specialized software has been slow in coming. But in the past year or two, more and more publishers have come out with products that answer needs much more specialized than word processing or database management, and "Specialized Software" will bring you up to date on these developments.

So join us as we step away from the ordinary applications of microcomputers to look at how they are handling some very different and very challenging jobs.

—Tom McMillan



Photograph by Kay Chernush/Wheeler Pictures

A TIMEX-SINCLAIR HELPS DR. GEORGE GANDER PLOT RABBIT TEMPERATURES IN THE PATHOLOGY LAB.

Tom McMillan is an associate editor of *Popular Computing*.

MICROS IN RESEARCH

Personal computers are proving their worth in the mainframe's traditional territory

If you want to do the job right, the saying goes, make sure you use the right tool. You don't try to wipe out the cockroaches in your kitchen with a bazooka, and you don't try to stop a tank with a Roach Motel.

More so than in other fields, scientists and engineers are debating this question of appropriate technology as microcomputers begin to move into research facilities and R & D departments around the country. How much computer is enough? How much is too much? Unlike most business managers, teachers, and others who are just becoming acquainted with computers, scientists and engineers have often spent their careers dealing with huge streams of numerical data and the sophisticated equipment needed to process them. Many are familiar, even chummy, with the mainframe computers that, to the rest of us, seem a little scary.

But microcomputers in their role as interdisciplinary tools are bringing together users from all walks of life, and this is true even for those who dwell in the heady realms of research labs. While they haven't been embraced as wholly as they have been by the business world, more and more microcomputers are finding their way—sometimes by the back door—into research facilities. Those whose work involves the recording and manipulation of numerical data are the primary proponents of micros, for the smaller machines offer savings of time and money compared to the traditional mainframe timesharing environment.

Besides these basic attractions, though, scientists, mathematicians, and engineers find the microcomputer a flexible tool. Micros are easy to implement in a variety of research environments. They are surprisingly powerful—in numerous cases, micros originally set up for simple monitoring or data plotting have performed further duties well enough to earn new esteem. And finally, thanks to open architecture and a wide range of peripheral options, the standard microcomputer can be easily customized to perform specific tasks.

Not everyone is welcoming microcomputers into labs and research facilities, though. Just as business managers and executives once smuggled micros past data-processing departments so they could put them on their own desks, researchers relying on smaller personal computers are sometimes meeting with resentment from those in centralized computing facilities. Traditions fall hard—but that, as they say, is the price of progress.

Because of the virtually infinite variety of research

and engineering projects underway at any time, it's impossible to come up with a neat description of the microcomputer's role in such projects. It is true, however, that in any given situation the micro finds its first job as a doer of dirty work.

While in some cases these jobs may be somewhat exotic (England's Laboratory of the Government Chemist has been trying out an assortment of microcomputer-controlled robotic arms that can

juggle batches of test tubes and weigh samples en masse), in most cases the lab work that micros are assigned is a good deal more mundane: where lab assistants or graduate students once monitored dials or readouts around the clock, Apple IIs or TRS-80s now record the data. But given this foot in the door, micros once used strictly for insignificant, routine tasks have often been given added duties.

Pinch Hitter Proves Its Worth

At the Stanford Linear Accelerator in Menlo Park, California, for instance, a humble Apple II filled in admirably when installation of the facility's new computing network was delayed. Dr. Stephen Williams, an experimental particle physicist, explains: "Our accelerator is a tube two miles long and three-quarters of an inch in diameter. A pulsed electron beam is steered down the center of the tube, and one thing we do is measure how far off center it is at the other end." Although the measurements are not terribly complicated, Stanford had ordered the new computer network to link the test equipment at the far end of the accelerator to the center's mainframe computer and provide a video display of the beam's position. But the new system wasn't ready on time, and costly delays seemed certain.

"I had this Apple II sitting in my living room," Williams recalls, "and I realized this is all I need—it has a display and a disk drive and everything. I developed an interface for the Apple and wrote a program that would have it display the beam's position." Amid a fair amount of initial skepticism, the Apple handled the job with aplomb. It remained in place for a year. Williams makes it clear that the long-awaited computer network would have performed a variety of tasks while the Apple did only one, but the Apple was on the job.

Williams's Apple is still humming away. "We use it for studying various detectors, testing out components, and doing prototyping work," he explains. "We now have a lot of big computers, PDP-11s and LSI-11s, sitting around in storerooms gathering dust. For some jobs, they're just not as convenient as Apples."

Dr. George W. Gander feels much the same way, only in his case even the Apple seems like too much computer. "For years, people have been using Apples for small-time computer work, the day-to-day crunching of numbers involved in lab work," he says. "But why tie up an Apple that costs a couple of thousand dollars when

you can use a computer that costs less than \$100?"

Gander, a professor of pathology at Virginia Commonwealth University in Richmond, is referring to his trusty Timex-Sinclair home computer. Gander's work involves injecting rabbits with a drug, then checking them for fever several times a day. "At the end of the day, we might have .15 data points to be plotted," says Gander. "Combined with the past week's experiments, we might have 50 or 60 points." Deciding that his Timex had all the power needed to keep track of the rabbits' temperatures, he brought it in, designed an interface, wrote a program, and that was that.

This minimal approach carries hidden bonuses, as Gander recalls: "Before, I'd be writing a manuscript with our bigger micro, a Radio Shack, and someone would come along and say, 'Hey, I've got some hot data here I want to plot. Let me use that.' So I'd put my manuscript aside and wait. It seemed silly to me to have a micro that size waste time collecting data."

Less Is More

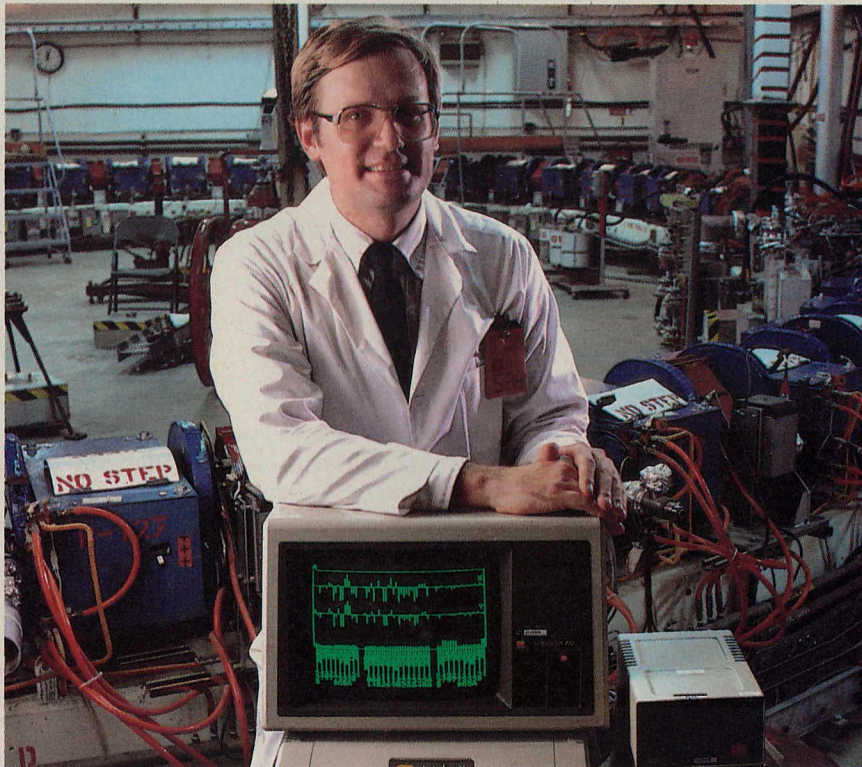
Even if a mainframe is available and the researcher knows how to use it, the smaller computer is often the more useful tool. A micro responds more or less immediately to the user's commands, and because the smaller machine can be dedicated to a given task, there is no waiting line, as is often the case with larger systems. And mainframe computer time generally isn't free.

"My students learned it was painful to use a mainframe," says Dr. Wasył Malyj, chief development engineer in serology at the University of California at Davis. "First, because it's noninteractive, you have to set up batch files, go off, come back later, and see if your results came out. Second, it was painful just to see your money disappear [to the university computing center]—\$500 a quarter is not unusual. Once students start to catch on and begin doing heavy modeling, they can easily spend \$500 a month."

Malyj and his students use computers to model human physiological systems like temperature regulation. His group now runs models on an Intel 86/330 supermicro. "With the micro," says Malyj, "if you do a run and you start to get some weird results, you can terminate your run, go back to the parameter file, and fix it. Now the students do as many runs as they want without worrying about money. Everybody has been able to finish their thesis projects, which is a first."

Maurice Zollner, an engineer at McDonnell Douglas in St. Louis, is another technical expert with access to

Even if a mainframe is available and the researcher knows how to use it, the micro is often a more useful tool.



DR. STEPHEN WILLIAMS FOUND THAT HIS OWN APPLE II PERFORMED ADMIRABLY AMIDST THE SPECIALIZED EQUIPMENT AT THE STANFORD LINEAR ACCELERATOR.

Doug Stewart is a freelance writer in Ipswich, Massachusetts. His article on digital type design appeared in the January 1985 *Popular Computing*.

more sophisticated equipment who nonetheless swears by microcomputers. Zollner relies on Apples to link test equipment to the satellite power units that McDonnell Douglas manufactures. "If a \$40,000 Hewlett-Packard minicomputer comes to a screaming halt, I'm in a whole lot of trouble," Zollner drawls. "If one of these Apples quits, I can throw it out, hustle down to the store and say, 'Hey, gimme another one of them things,' and hustle back to the lab. There's nothing wrong with a bigger machine, but sometimes it just doesn't fit."

Micros Open New Doors

While in many cases micros have performed well as stand-ins for larger machines, perhaps their most profound effect has been on the way people do research as well as on the way that research is made public. Obviously the microcomputer is not going to show up a mainframe when it comes to high-energy physics research or modeling the atmosphere, but the sheer ubiquity of the little machines in labs, universities, and even in the homes of technical researchers has created a much more open research community.

"The contribution that the micro makes is really a social and economic one," says Dr. Leonard Adleman, a mathematician and professor of computer science at the University of Southern California. Adleman is a big name in the theoretical world of cryptography; he is the A in RSA, an as yet uncracked scheme for making secret "public-key" codes. The heart of all public-key cryptography is the computer. "The micro makes encryption and decoding possible for people to do at home," says Adleman. "It increases the number of people who can work on these problems. Also, micros make the transmission of people's work much easier. For example, I came up with an algorithm—a computer program, that is—for determining if a large number is prime, which is an important part of public-key cryptography. Now someone in my field can buy this program and tell if a number's prime." Thus the micro, with easily distributed software such as Adleman's program, has helped to bring once arcane studies like cryptography out of academic alleyways.

Because Adleman and his peers don't have to share their micros, they are free to let them run all night on a single thorny problem. At a convention of cryptographers in Santa Barbara in 1982, Adleman bet his colleagues that before the conference ended he could break one of RSA's rivals, the so-called Graham/Shamir knapsack scheme. He assigned his Apple II to the task (he has since switched to an IBM PC), retired for the night, and found the solution glowing on the Apple's screen when he awoke the next morning. To be sure, it was not processing power that won the day: "I could do it on an Apple II rather than a mainframe or a mini because some people in Europe had just invented marvelously fast algorithms," Adleman says. "A few years before, it couldn't have been done on a Cray supercomputer." But without a more or less portable computer to pull off his tour de force, Adleman would have had no choice but to publish his results in the fine print of an academic

journal. "Letting an audience of my peers watch was much more convincing," he claims.

Number-crunching is the basis of all cryptography, and even researchers working with the latest algorithms use computers largely as big calculators. But in more abstract mathematics, researchers have been using mainframe computers since the '50s to simplify expressions, factor polynomials, find derivatives, and perform other feats of algebraic manipulation. And muMATH, a software package developed by Dr. David Stoutemyer of the University of Hawaii, has thrust micros into the thick of such tasks.

Like others, Stoutemyer and his students had found buying mainframe time to be frustrating, expensive, and inconvenient. While Stoutemyer doesn't claim that muMATH can begin to match the power of mainframe algebra packages, he does feel that his program is much easier to play with. "The difficulties of using a mainframe can be enough of a deterrent to keep people from trying," he says. "Micros are permitting people to do things they've avoided in the past. And they can use them in the privacy of their own homes, where stupid mistakes won't be revealed."

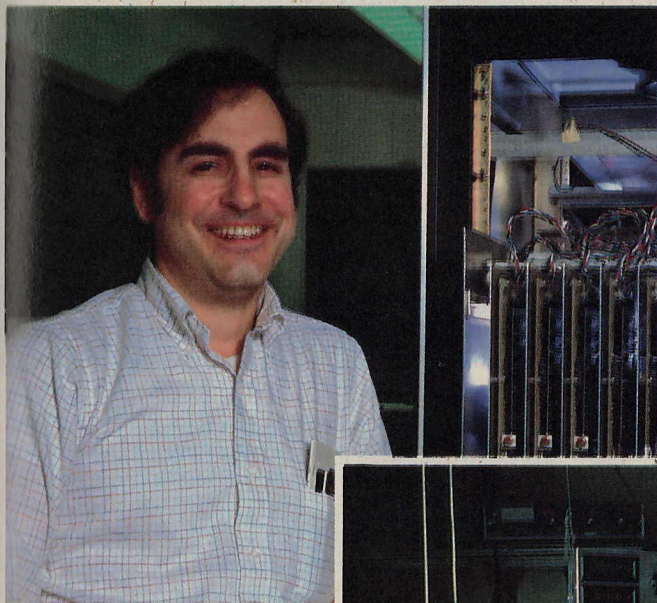
As the work of both Adleman and Stoutemyer illustrates, effective microcomputer software for science and engineering has just recently become widely available. The lack of such software in the past forced researchers to rely on programs that were either written for a specific instance or were disseminated through scholarly journals, and that fact certainly slowed the scientific community's adoption of the microcomputer. While this is changing today (see "Specialized Software" on page 75 for a more detailed report), other factors still stand in the way of the micro's total acceptance.

Old Dogs and New Tricks

Not everyone involved in science and engineering is dying to use a microcomputer. Plenty of people in technical fields, especially those in the natural sciences, continue to shun computers of all kinds. For these people, micros can seem like an added threat. "Many scientists just hand data to technicians and tell them to do this or that computation," says Dr. Diane Gabaldon, who edits *Science Software Quarterly* at Arizona State University in Tempe. "They're reluctant to use micros because they don't want to have to do the work that they now delegate."

Dr. Raymond Dessy of Virginia Polytechnic Institute's chemistry department in Blacksburg has surveyed the way micros are being used in scientific laboratories, and he agrees that the arrival of the small machines is not always welcomed. "About half the attempts to computerize labs fail," says Dessy. "There's the problem of ego, power struggles, the difficulties you have in any organization that already has centralized computing. Distributed computer power can be seen as a threat."

Beyond these interpersonal struggles, says Dessy, the micro environment does have limits that are not always recognized. "We've had people who wanted to track eyeball movements of 15 patients concurrently with an

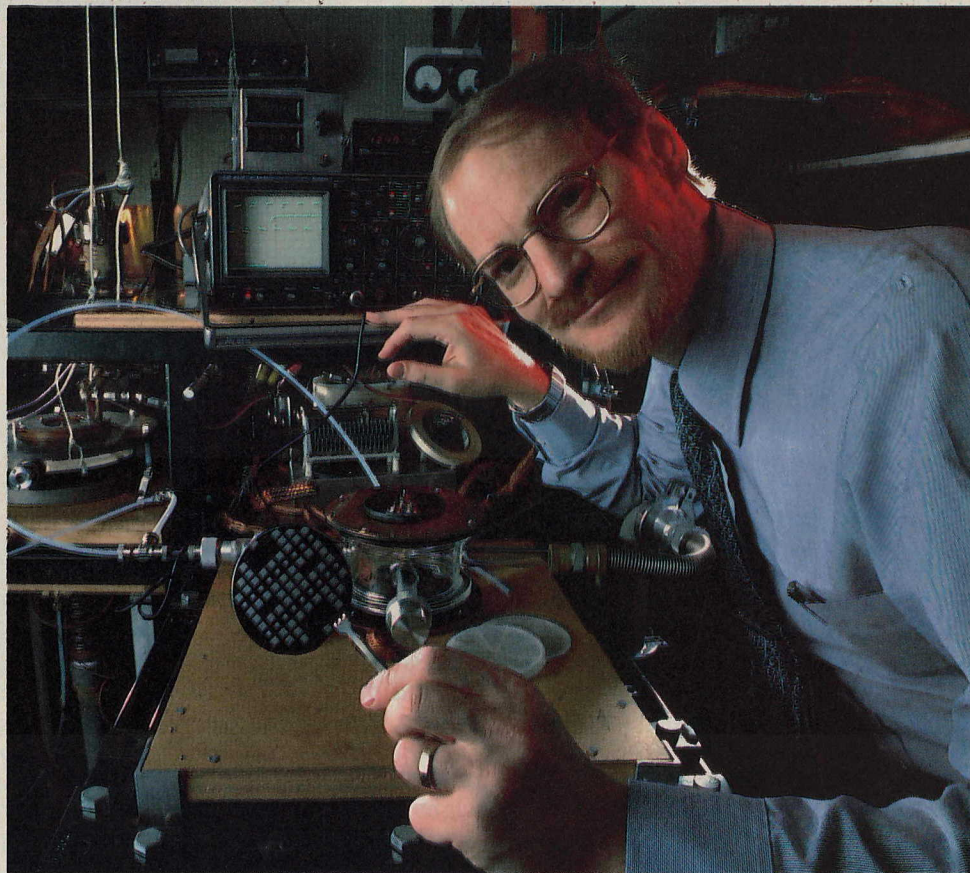


Researchers facing formidable problems have created systems that push the limits of micro-computer design.

IBM PC. Well, good luck. They don't understand basically what computers do. They expect micros to emulate all the things mainframes have been doing." Until microcomputers are more fully accepted and their powers recognized for what they are, such problems will persist.

But in other cases, researchers facing particularly formidable problems have created systems that blur the limits of what we can properly call microcomputers. Drawing on the latest advances in hardware, networks, operating systems, memory devices, and processor technology, those on the leading edge of scientific research have developed effective new computer configurations for specialized work.

For instance, Dr. Daniel L. Flamm, a chemical engineer at Bell Laboratories in Murray Hill, New Jersey, relies on the flexibility of the Unix system to increase smaller computers' power and adaptability. Flamm's concept of a microcomputer is not necessarily what you or I might have in mind, though. "We have stand-alone Unix systems in the labs that people here have put together for \$5000 or \$6000," he reports. "These are much more powerful than an IBM PC. And with Unix, programs move right across different brands and architectures of computers. If you're working at a small computer and you run out of room, you just run it up onto



**CARNEGIE-MELLON'S
DR. MICHAEL LEVINE
(TOP) AND BELL LABS'
DR. DANIEL FLAMM
POSE WITH THEIR
SOUPED-UP MICROS.**

Even theoreticians are building their own 'computational engines,' making it difficult for traditional funding agencies...

a minicomputer or one of the mainframes."

Another researcher who is not hindered by the limits of the micro is Dr. Michael Levine, a particle physicist at Carnegie-Mellon University. Levine is "gluing together" a hybrid that defies the usual categories. He calls it a multimicro computational engine and admits that until he found a nice box to put it in, the device looked wretched. Essentially, Levine bought a slew of 8087 arithmetic coprocessor chips from Intel and is now in the midst of wiring them together. He plans to use the assemblage to calculate the relationship between the electrical charges of electrons and their magnetic moments, a job that requires a tremendous amount of computation.

"The object here," says Levine, "is to design a minimal, single-board computer and just start making it bigger and bigger. A little memory, but not too much. Disks? Well, no, attach the 8087s to some other machine that already has disks. The same with screens. Pare it down so you're spending only a few hundred dollars per chip." So far, Levine has wired up 19 of the 8087s, and he expects to have 50 or 60 working together before long. His goal is to get into the hundreds.

"A Cray [supercomputer] is somewhere in the range of 50 times as powerful as a VAX. A VAX is eight times as powerful as an 8087 chip. So the Cray is roughly 400 times as powerful as an 8087, for arithmetic purposes. Four hundred 8087s at \$100 each cost us \$40,000. One Cray costs \$10 to \$20 million." Of course, he admits, four hundred 8087s do not equal a computer, but he expects the cost of building a functioning machine to be only twice the cost of the chips alone.

Levine's approach is likely to become more common as components grow in power and researchers become more venturesome, but right now few are following his lead. "It takes patience and dedication to deal with mistakes, and a lot of labor," he reports. "That cuts out the amusement value for a lot of people." He adds that homemade computational engines make sense only if you're dealing with problems that can be broken down into many smaller problems, and if you don't need all their solutions by daybreak. Although the hassles of

tinkering deter many a researcher, Levine notes that even pure theoreticians are beginning to build their own specialized devices. "There are theoretical physicists sitting there with soldering irons in their hands," he says. "That's a little difficult for the funding agencies to deal with."

The Future

As this trip through scientific laboratories, engineering centers, and university research facilities has shown, it's difficult to generalize about the microcomputer's current role in this arena. In the business world, all companies share certain standard applications. The microcomputer, together with widely applicable, well-designed software packages, has assumed these routine duties with ease, leading to what has aptly been called a revolution. But research in science and engineering is vastly different from business—almost every experiment or research project involves highly specific applications and the ways in which microcomputers have been used reflect this variety.

Still, some conclusions are evident. In ever-increasing numbers, microcomputers are finding a place in labs and research centers. The fact that much of this infiltration has been by chance rather than choice reveals that the smaller machines' convenience, adaptability, and power have proved their worth even in the face of considerable skepticism. As George Gander, the researcher who used his Timex-Sinclair to monitor rabbits' temperatures, puts it, "The people who are really doing research are always ready to accept a new piece of laboratory apparatus, because that's how you push back the frontiers of science."

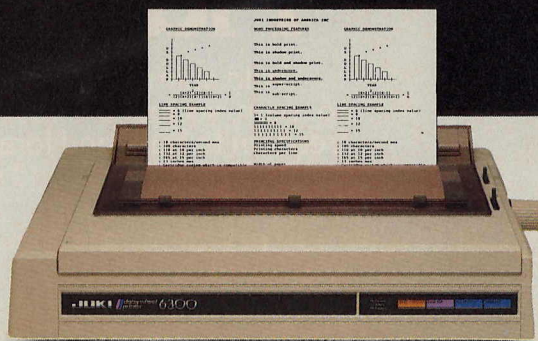
All indications are that the trend is expanding. As microcomputers continue to become more powerful, their applicability will grow. Software designed to handle technical challenges is becoming more available every day, and this too will enhance the micro's powers. And perhaps most important, technical types are ever more willing to give the little machines a chance. Researchers who were not around during the '50s and early '60s—the heyday of the mainframe—are likely to have encountered the microcomputer early in their careers and thus have a higher opinion of its value.

As suggested earlier, though, the most profound aspect of the microcomputer's burgeoning role in scientific research is a social one. The microcomputer—indeed, the entire high-tech revolution that it has occasioned—is bringing our culture together and providing new direction and energy. The fact that everyone from farmers to physicists, from major-league baseball managers to chemical engineers, is becoming conversant with and beginning to depend upon the same technology can only provide a new sense of community and have a positive, leveling effect on our society.

The image of the "mad" scientist doing what he knows what in the nether reaches of a forbidding, unfamiliar laboratory doesn't work today, and in large part we have the microcomputer—the most flexible, widely adaptable tool ever invented—to thank. □

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SPECIALIZED SOFTWARE

The problem-solving program you need is probably out there somewhere—here's how to find it

Microcomputers are often marketed as “problem-solving” tools, and for those whose problems center around working with words, managing information, or analyzing financial statements, today's machines and software certainly live up to the promise. But what about more specialized or technical applications, such as performing esoteric calculations, developing sophisticated statistical analyses, or grappling with more subjective judgments? All too often, the typical software dealer will still try to sell customers facing such problems a standard system running a popular package like Lotus's 1-2-3 or Ashton-Tate's dBASE, and disappointments rather than solutions can be the result.

You can't really blame the dealer, who has an ever-growing number and diversity of products to handle. But the fact is that today's commercial software marketplace includes more and more applications packages designed to address specific, often technical needs. These specialized packages can be hard to find, however—many of them are relatively new and unknown, and because their potential market is often smaller, they are not as heavily advertised or publicized as more general-purpose software.

In this article we aim to give you a broad overview of software products that go beyond the standard word-processing, database management, and spreadsheet systems. Recognize from the start that because we're talking about specialized applications, the burden will be on you to define what you need. While everyone knows what a word processor does and almost everyone can benefit from one, only you can decide if, for instance, an equation processor or a modest expert system will answer your needs.

We'll look at four types of specialized problem-solving software: arithmetic and algebraic packages designed to solve equations or perform symbolic manipulations, hard-core statistical systems, expert or experi-

ence-based systems, and decision-making aids that support informed subjective judgments.

Math Packages

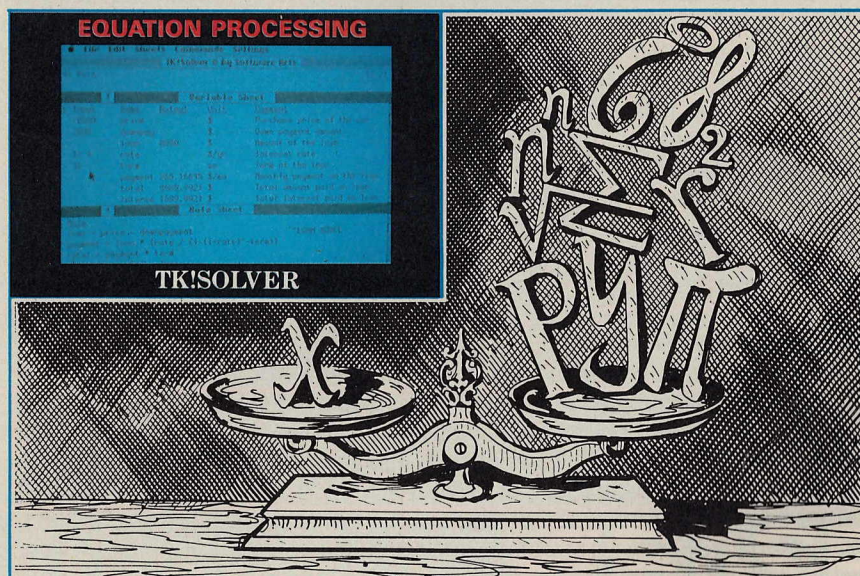
In the eyes of accountants and financial analysts, modern spreadsheets are wonderful tools. But ask a mathematician, engineer, or researcher about spreadsheets and you're likely to hear some reservations. Problems that involve more than one variable don't fit the

spreadsheet model well because it's intrinsically geared to solve in one direction only—that is, to solve for the same variable repeatedly. Similarly, tasks requiring symbolic manipulation of algebraic statements are beyond the capabilities of spreadsheets.

Some more specialized software packages will handle these chores, though. TK!Solver, from Software Arts Inc. (27 Mica Lane, Wellesley, MA 02181; (617) 237-4000), is often described as an “equation processor,” and the program has a loyal following among engineers, scientists, and even some business people. Let's look at a very simple example to see how TK!Solver works.

In optics, the size and location of an image created by a lens can be found with the formula $1/p + 1/q = 1/f$, where p is the distance of the object from the lens, q is the distance of the image from the lens, and f is the lens's focal length. You could set up a spreadsheet model that would repeatedly find q for any values of p and f you specify, but it would find only q . After entering the formula into TK!Solver's Rule Sheet, though, you're given the opportunity to specify *any* two variables on the program's Variable Sheet, and the software will supply the value of the unspecified variable.

This example is very simple, but it does illustrate the basic difference that sets TK!Solver apart from spreadsheet calculations. The program will perform far more



Barbara E. and John F. McMullen are the authors of *Microcomputer Communications: A Window on the World* (Wiley, 1984).

advanced calculations: you can enter a series of simultaneous equations and TK! will use its Iterative Solver mode, which invokes the standard Newton-Raphson formula to refine an estimate until it is the closest approximation mathematically possible. TK! will also process lists of values for any variable, perform unit conversions, plot graphs or tables based on what it finds, and print its results. Additionally, special-purpose Solverpacks provide templates that furnish the formulas, functions, and unit measures typically encountered in a given field, such as mechanical engineering or financial planning.

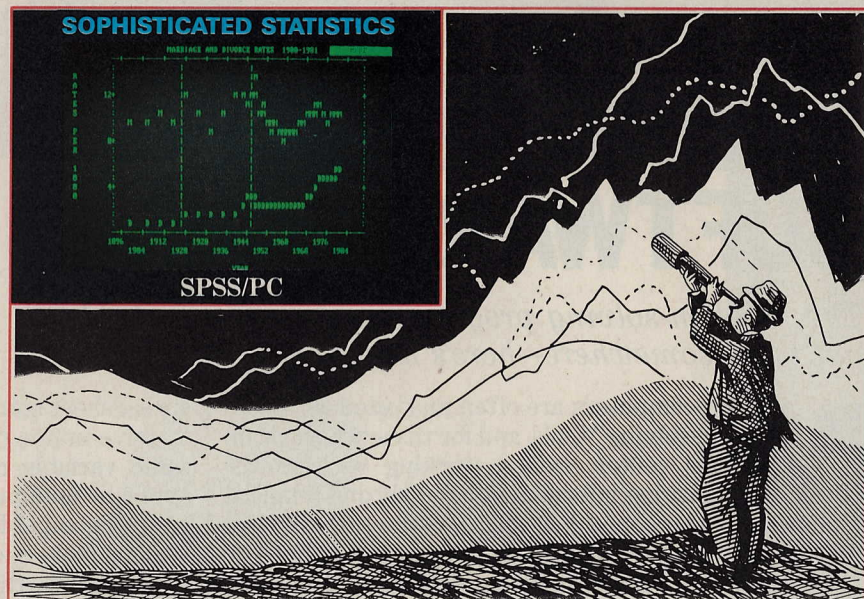
Something that TK! won't do, however, is combine and simplify algebraic expressions—its output is limited to the numerical. Symbolic manipulations (such as, to use another elementary example, $a+a=2a$) are the province of what are often called symbolic math packages, and perhaps the best known of these is muMATH, developed by Dr. David Stoutemyer and marketed by Microsoft Corp. (10700 Northup Way, Bellevue, WA 98004; (206) 828-8080). If TK!Solver processes equations, we might say that muMATH manipulates them, dealing with them symbolically to reduce terms, differentiate functions, expand polynomials, find derivatives and integrals, and so forth.

The "trickle down" effect from mainframe systems is fast at work in the area of mathematical software, and we're certain to see greater power on the microcomputer level in just a few years. Dr. Richard Pavelle of Symbolics Inc. in Cambridge, Massachusetts (marketer of the mainframe math package Macsyma) feels that we'll soon see spreadsheets that include algebraic functions—spreadsheets that will be far more flexible and powerful than those we know today.

Although both TK!Solver and muMATH have been around for a couple of years, their appeal has been primarily to a relatively small market of engineers, mathematicians, college educators, and other specialists. But as we've indicated, their capabilities could be applied to a much broader range of problems in a variety of fields. If you've found that a spreadsheet doesn't give you the flexibility you need in analyzing numerical or mathematical relationships, these math packages deserve your attention.

Statistical Solutions

Market researchers, social scientists, planners in industry and government, and researchers who face the problem of drawing statistical conclusions from reams of numerical data are also sometimes disappointed in spreadsheets. For example, Lotus's admittedly powerful 1-2-3 provides statistical functions such as minimum, maximum, average, and standard deviation, but it does not give you a convenient way to handle multiple regres-



sion calculation, crosstabs, and other more powerful functions. If you need functions like these, you'll want to consider a package such as SPSS/PC.

SPSS/PC, from SPSS Inc. (444 North Michigan Ave., Chicago, IL 60611; (312) 329-2400), is an optimized microcomputer version of the well-known Statistical Program for the Social Sciences, a mainframe statistical package found in most university data centers and used by researchers and analysts in virtually every field. Because the microcomputer version maintains the syntax and command structure of the mainframe system, users fluent in either version can move rather easily between the two. The versions differ mainly in that SPSS/PC has an interactive mode in which commands can be executed one at a time, while the mainframe version of SPSS operates only in batch mode.

In addition to the statistical functions of the system, SPSS/PC includes the Kermit file-transfer program so you can easily transfer information between versions of SPSS. SPSS/PC can also import or export any standard ASCII file, allowing you to bring in data from other programs. The program, which comes on eight floppy disks, is clearly intended for use with a hard disk.

A complete description of the powers of SPSS/PC would take us far beyond the scope of this article—suffice to say that anyone who has been frustrated by trying to perform serious statistical analysis in a spreadsheet environment will be much more comfortable working with SPSS/PC or a similar package. (Seven other statistical programs for microcomputers were reviewed in our October 1983 issue.)

Learning from Experience

Some technical problems, however, have little or nothing to do with numbers. For instance, no amount of equation processing or statistical analysis is going to tell you what's wrong with a piece of machinery that has just broken down or what ails a patient who is gasping for breath and turning blue. These qualitative "judg-

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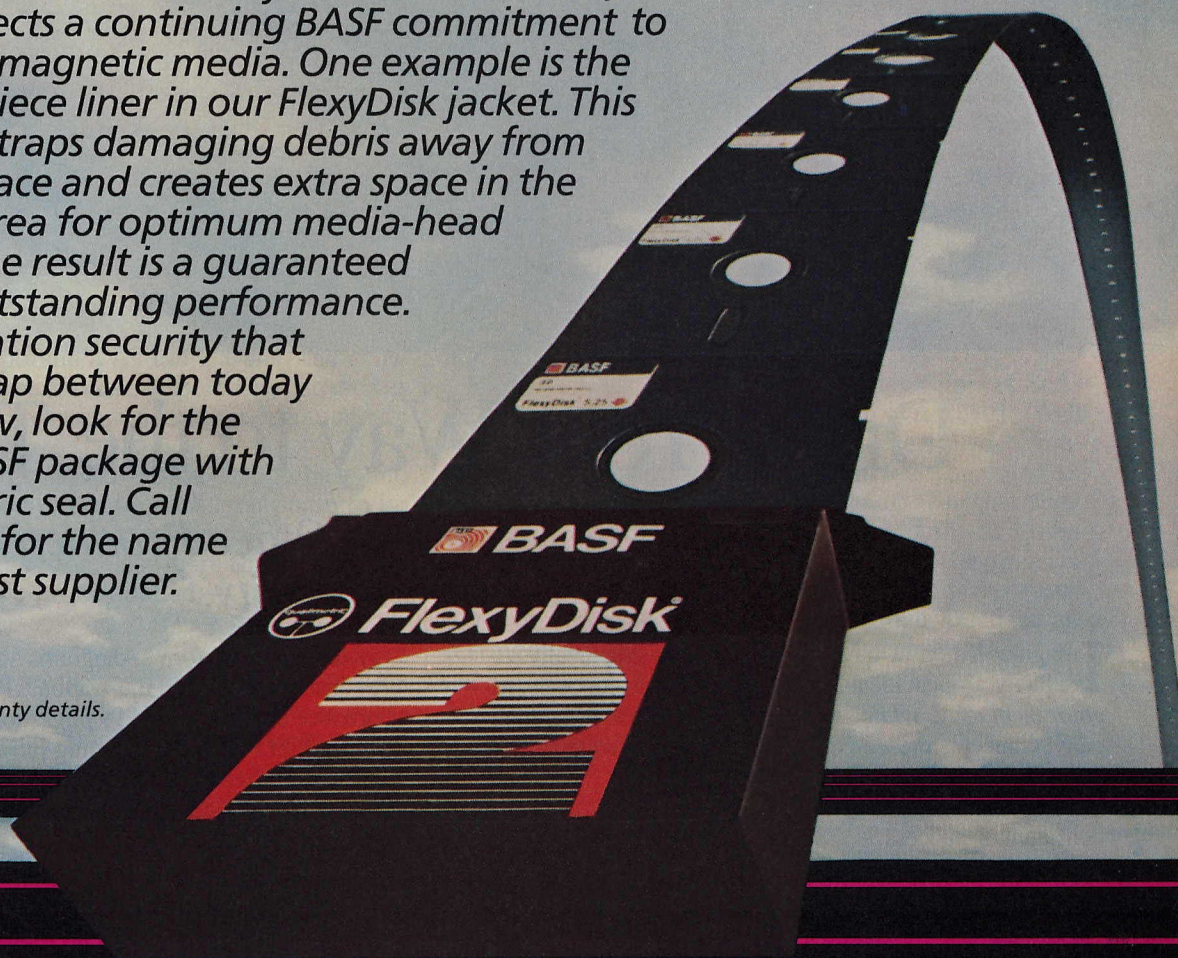
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ment calls" are usually made by experts who base their decisions on years of experience. But the fact that such experts are hard to come by and expensive to keep has led to large-scale research and development of "expert systems," computer programs that are designed to lend expert advice to those facing problems that typically demand extensive and specialized experience.

Until recently, such systems were quite expensive and ran only on mainframes. However, with the introduction last year of Expert-Ease (Human Edge Software, 2445 Faber Pl., Palo Alto, CA 94303; (415) 493-1593), expert systems have begun to reach the microcomputer user. Developed in Scotland by Dr. Donald Michie (who was once, incidentally, a colleague of Alan Turing), Expert-Ease lets you set up quite sophisticated expert systems that are especially appropriate in situations where you repeatedly rely on the same experiential base.

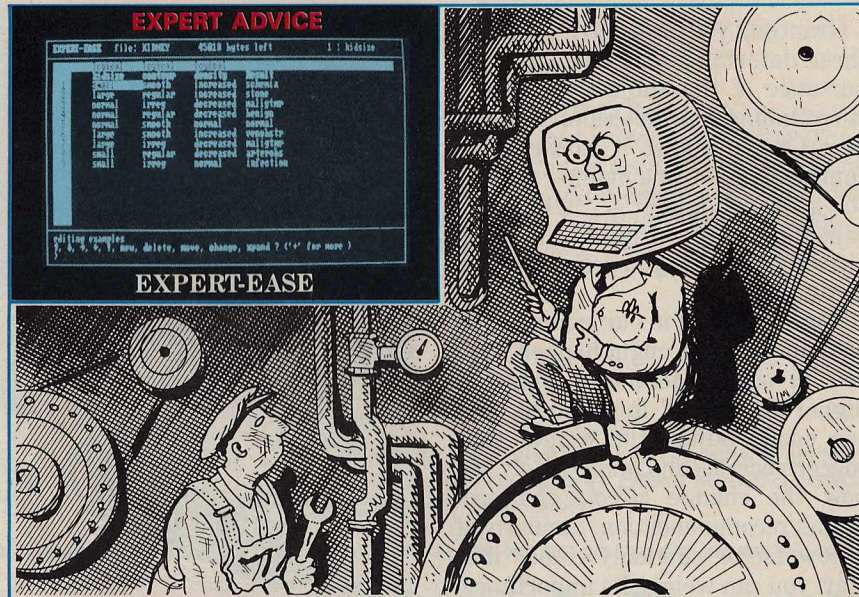
The first step in using Expert-Ease is entering the expert knowledge on which the system will base its recommendations. First, you enter attributes, which will become the points on which the system questions you. Next, you provide some examples that, in effect, teach the system how to pursue a solution. Using the attributes and examples you furnish, Expert-Ease generates a set of rules that the system uses as it formulates a series of questions.

When you've set up the expert-knowledge base and are ready to put the system to work, you begin to interact with Expert-Ease by answering the questions it poses. But the expert system does more than simply run down the attributes you've supplied—it uses the rules generated from the examples you've entered to determine what questions pertain and in what order they should be asked. You answer each consecutive question by entering one choice from the set of possible answers the system provides, and finally, after you've answered all questions, Expert-Ease gives you its recommendation. In practice, of course, the human expert who supplies the attributes and examples is not likely to be the one who seeks advice from the system.

Expert-Ease is an extremely flexible tool. With it, you can develop a system to assist in the solution of any problem that is bounded by identifiable rules—whether it be medical diagnosis, chemical analysis, engineering design, or even purchasing the right stock at the right time. Other developers are at work on similar systems, and the field should burgeon in the months to come.

Seat of the Pants

Even further from numerical analysis are those decisions made by applying what we might call informed subjective judgment or, in the vernacular, "seat of the



pants" management. Even scientists and other researchers rely on intuitions of this sort, which they then test experimentally. But the process is always suspect in that all the pertinent facts may not be in proper perspective. Also, when such a decision turns out to be incorrect, it is difficult to understand what went wrong and how to avoid the same mistake in the future. However, new decision-management or decision-support software promises to provide firmer ground for making subjective decisions.

Expert Choice, developed by Decision Support Software Inc. (1300 Vincent Pl, McLean, VA 22101; (703) 422-7900), is one of the most powerful decision-management packages. The program lets you enter all relevant aspects surrounding a decision—whether they be hard facts, subjective inclinations, or both—and then weight each consideration. From this input, the program organizes the problem in the classic inverted-tree structure: your goal is the main trunk, primary criteria affecting it are the larger branches, less important considerations are the smaller branches, and so on through a total of six hierarchical levels.

For an example of the type of problem suited to the Expert Choice approach, let's consider the thankless task of deciding where to locate a toxic waste dump. Most of the factors involved in such a choice are objective and quantifiable—geography, proximity to ground-water supplies, soil type, and so forth. But other considerations are far more subjective, such as the aesthetic impact on neighboring areas, responses to local politics, and the like.

Expert Choice gives you a way to balance the objective factors with the subjective ones. You enter objective data and subjective concerns into the program and then weight the importance of each concern according to your decision-making intuitions. Employing the "analytic hierarchy" process, Expert Choice will furnish an answer based on its coordination of all pertinent data and the importance that you assign to each factor.

SPECIAL REPORT: PART TWO

Granted, you still have to make these determinations about the importance of the subjective choices surrounding the decision, but Expert Choice makes it easier to be confident. Also, in a manner similar to a spreadsheet's "what if" capabilities, the program lets you alter the weights you assign to each factor.

For instance, if in our example you want to see what might happen were you to assign aesthetic impact a higher degree of importance, you can easily adjust the weight that concern carries and immediately see how the change affects the program's recommendation. Similarly, if a new factor suddenly comes into play, you can weight its importance, enter it into the program, and get a revised recommendation without having to rethink the entire problem. Also, the program documents the complete decision-making process so that you can use the model as a guide to making similar choices in the future.

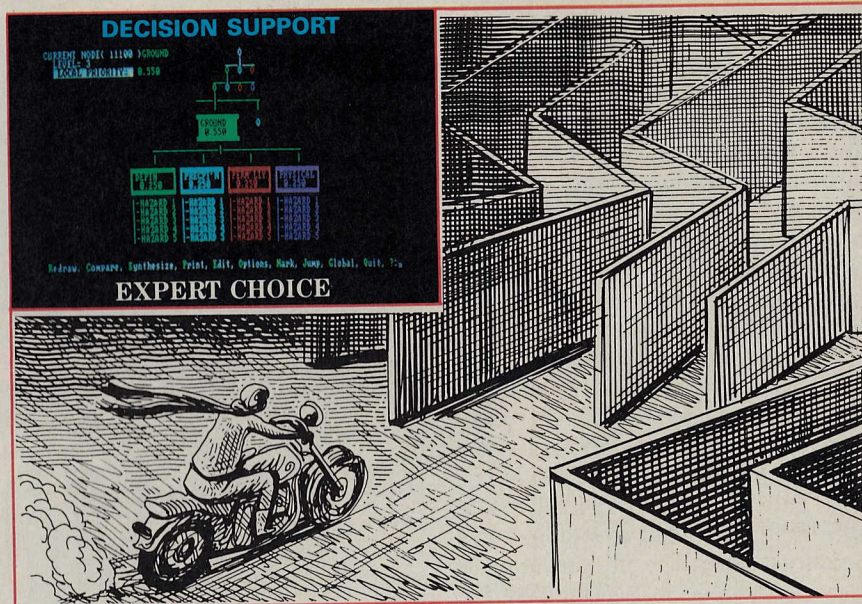
While both Expert Choice and Expert-Ease are qualitative rather than quantitative, they differ significantly in emphasis. Expert-Ease processes facts or the informed judgments of experts; the user being questioned by the system may have no actual knowledge of the elements underlying the final decision. Expert Choice, on the other hand, is a strongly interactive system that relies heavily on the subjective judgments of the user for its recommendation.

Decision-support software is a rapidly growing part of the industry. While Expert Choice is perhaps the most powerful such package, similar software is available from Lightyear Inc., Analytica, and Human Edge, among others. Those who have to grapple with complex subjective decisions can now expect the computer support that number crunchers have enjoyed for some time.

Other Problem Solvers

The four types of problem-solving software we've looked at so far represent distinct alternatives to more widely used programs such as the popular spreadsheets and database managers. Another approach worth mentioning, however, is something of a hybrid—the "vertical market" products that enhance broader-based systems with specialized templates, models, or files suited to narrowly defined, job-specific applications.

We've already mentioned the Solverpacks that fortify TK!Solver's powers for particular uses, and a rapidly growing universe of analogous products is developing around successful packages such as 1-2-3, dBASE II, Visicalc, Multiplan, and others. For instance, to customize your spreadsheet for tax accounting, real estate management, investment analysis, or a number of other specific uses, you can find add-on products that will answer your needs quite well. The best place to begin



your search for such enhancements is with the publisher of the basic, underlying system—Software Arts will tell you what's available for Visicalc, Ashton-Tate for dBASE, and so on. Similar specialized add-ons are available in book form, frequently with the basic program code on disk.

In closing, we must reemphasize the point we made at the outset: our aim in this article has not been to supply an exhaustive survey of problem-solving software (indeed, such an unlimited survey would have to be a book), but to show you the range of options now on the market and encourage you to look beyond conventional, well-known programs for solutions that might answer your needs more exactly.

Because everyone's needs are slightly different, the choice finally must be yours. Here are a few tips to keep in mind as you pursue software that best suits you:

- Define your needs as precisely as possible. You can't expect anyone else to do this for you, and without such a definition, you won't recognize your appropriate choice even if it jumps into your pocket.
- Use a variety of sources—not just your local retailer—for information about what's available. Perhaps one of the solutions covered here is just what you need, but if you're not sure, you can also rely on current software directories, professional societies, or even consultants.
- Keep looking. As more and more software developers realize that the market has little room for another spreadsheet, word processor, database manager, or other standard application, they are increasingly directing their efforts toward more specialized products designed to fill heretofore empty niches.

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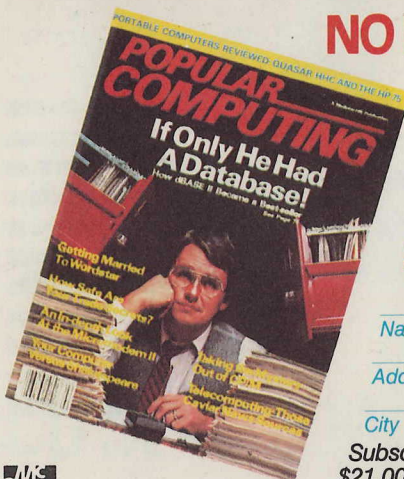
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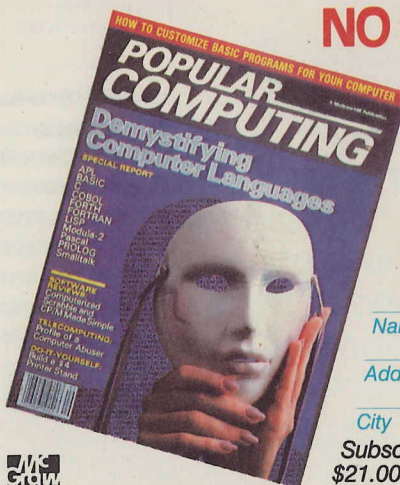
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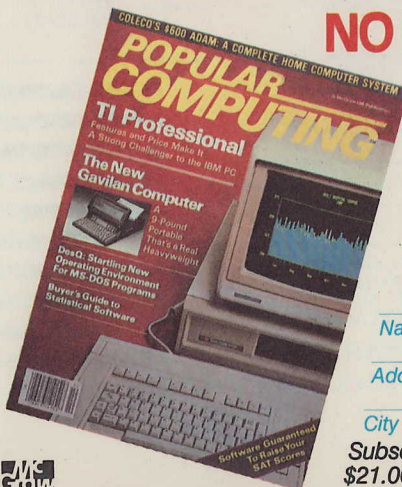
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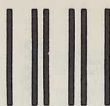
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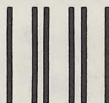
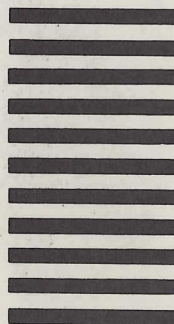
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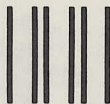
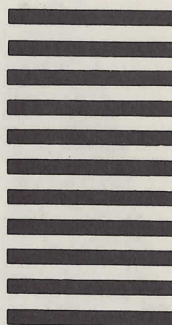
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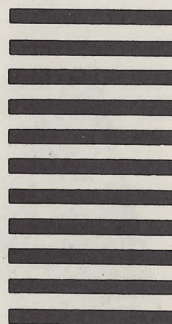
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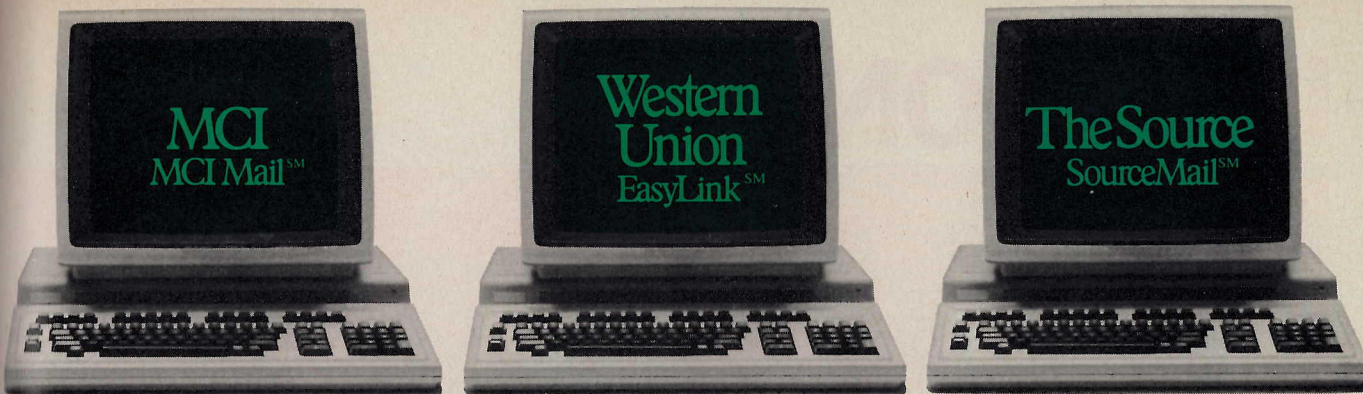
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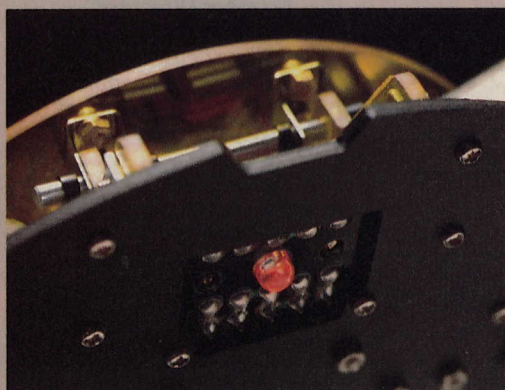
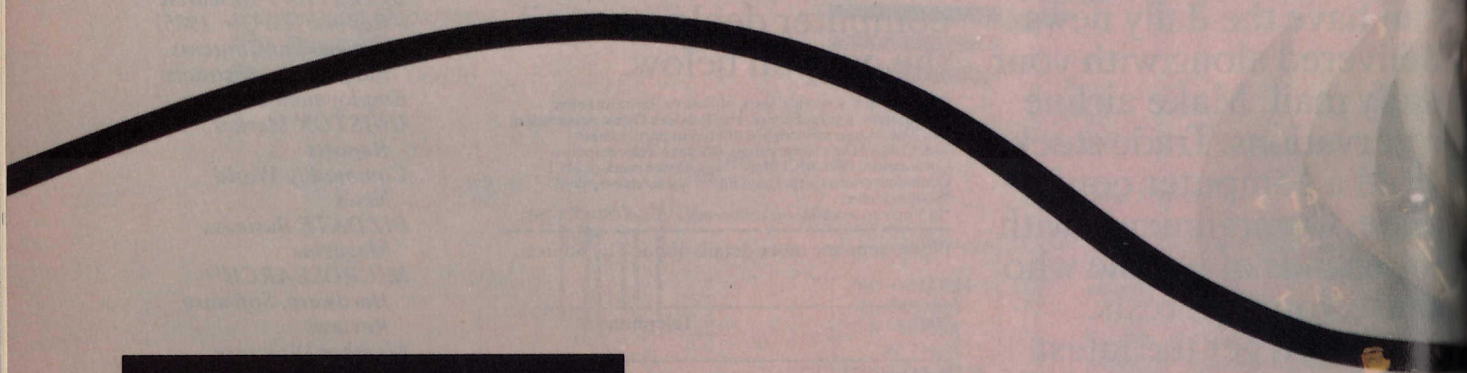
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INVASION OF THE MOV

How a band
of robots marched
into one
technophile's life



The Line Tracker barrels down a track made of black tape (above) that it detects with a simple infrared sensor on its underside (left).

ITS

by Dan McNeill

Robots invaded my home recently. They conquered it too, though I'm still not sure how. They were little robots known as Movits, able to fit into the palm of my hand. Their weapon is an eerie, hapless charm.

At first, they seem unprepossessing. They have clear plastic domes and look like enormous insect eyes mounted on wheels or feet. Inside the domes you can see wiring. The rest of their bodies is also plastic—colored yet transparent—so nothing

is hidden.

The overall impact is of creatures half-electronic, half-animate. I did not want to scoop them up and cradle them to my chest.

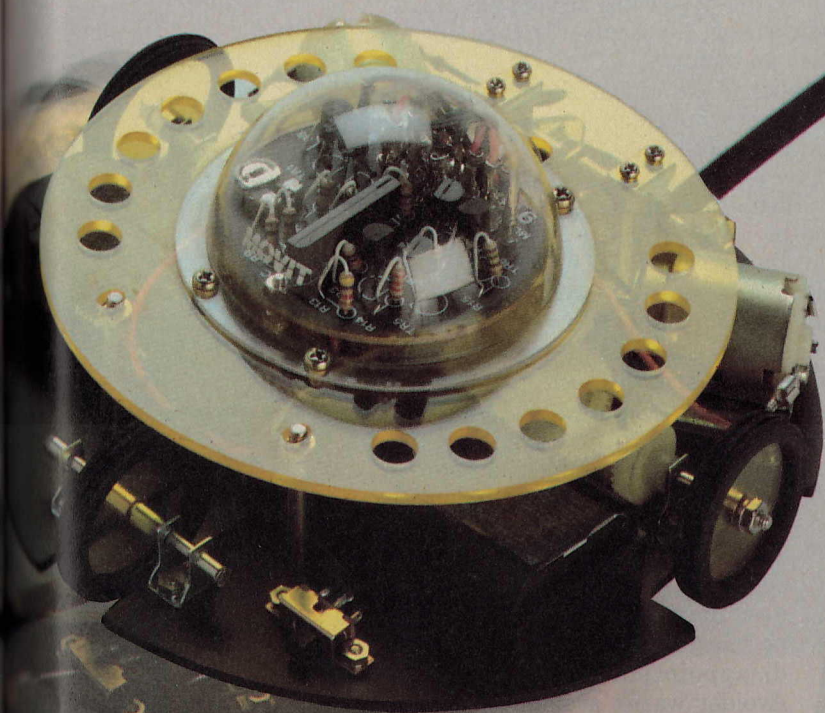
But living with them brought transformation. As I got to know them and see them moving around, the hard-wired-bug impression disappeared. Personalities emerged: some are sober, others are antic, and most are both at once. Soon I was seeing their domes as heads, housing individuals with odd, urgent intents. They insinuated themselves into my life, and almost before I knew it, they were firmly lodged there, rolling about, pirouetting, or marching along like something out of *F-Troop*. How did it happen?

Piper Mouse Vs. Boy Terror

The first hint of the trouble ahead came from the Piper Mouse, a three-wheeled robot that responds to high-pitched sound. Blow on the whistle that comes with the Mouse, and it zips along the floor, its dome tilted back rakishly, as though bent on raising hell.

I invited my in-laws over, and

Dan McNeill is a freelance writer living in Culver City, California.



Movement is the key to every Movit. Stationary, they're undistinguished. In action, personalities emerge.

they obligingly brought my 3-year-old niece and 2-year-old nephew. My niece is a sweet, intelligent youngster who likes to play gentle games and read children's books. My nephew likes throwing things around. When this indefatigable boy approaches an item like a VCR, a shudder runs through the room, a cry goes out to him, and he responds with a smile of the purest pleasure you will ever see.

I placed the Piper Mouse on the table and began blowing the whistle, making it start and stop. The adults got a kick out of it, but the children loved it. Every time the whistle blew, they screamed with laughter at the funny device. Then they discovered that their own laughs and shrieks could control it—it was incredible, magic! Never before had an inanimate object responded to their cries, and now one was rolling around like crazy. Amazed at this new power, my nephew stayed out of mischief for at least 45 minutes.

This incident established the appeal of Movits beyond doubt. Exactly what they appealed to was harder to discern, but I soon got another clue.

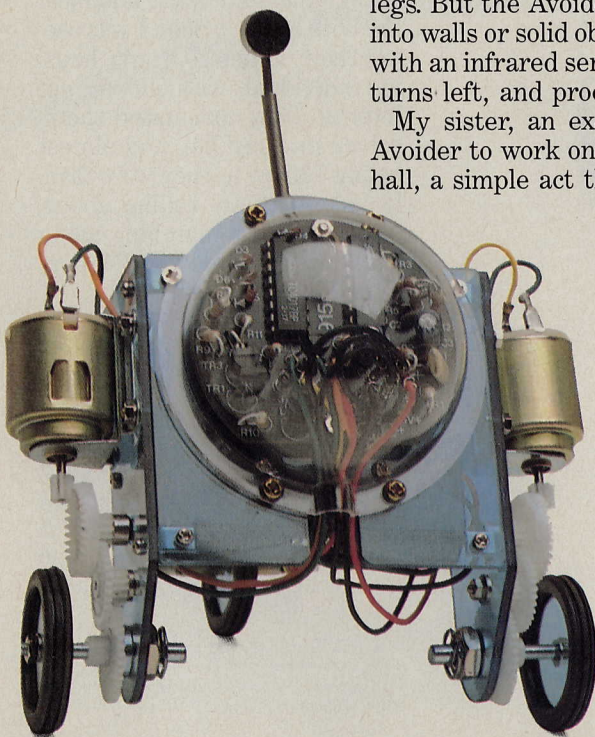
Avoider Takes on Bank Execs

The next encounter involved the Avoider, a determined robot that walks like a bulldog with six wooden legs. But the Avoider is not so stubborn that it barges into walls or solid objects. It detects an object in its path with an infrared sensor, halts at the last minute, slowly turns left, and proceeds in a new direction.

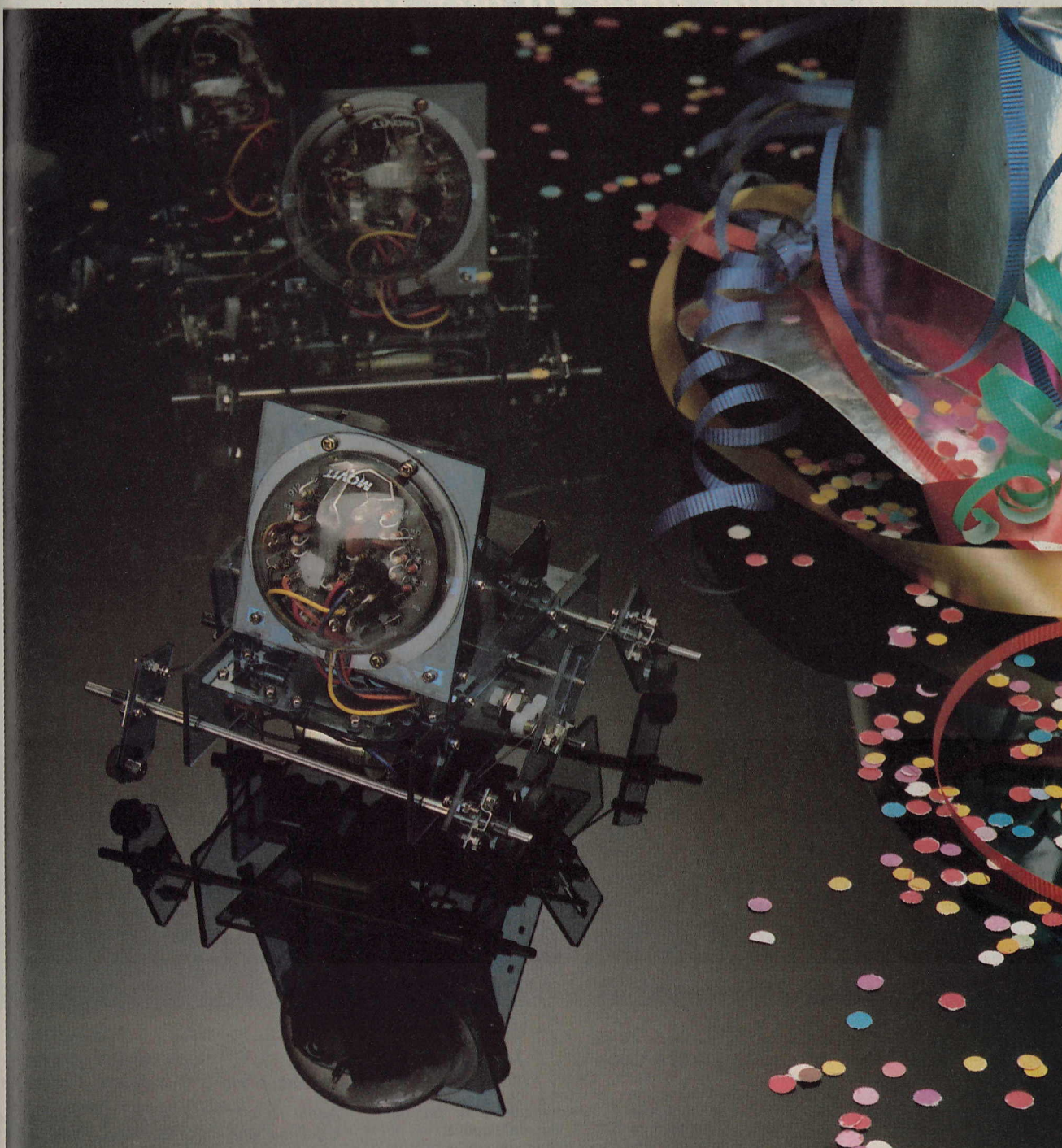
My sister, an executive in a large bank, took the Avoider to work one day and sent it walking down the hall, a simple act that occasioned considerable merri-

ment. However, when one banker put his foot in front of it, the Avoider walked right into it. The robot's infrared beam was going over the top of his shoe, so it had no cue to halt. The man seemed disappointed. This so-called Avoider wasn't avoiding.

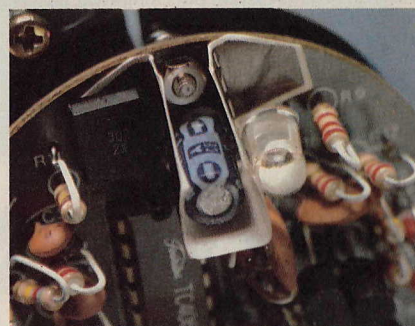
He was missing the point. Avoiding is not this robot's basic talent. Motion is. The Avoider's appeal is its special, almost tank-like gait. Its feet clamber forward, its "shoulders" tilt back and forth, and the robot moves inexorably ahead, like a Galapagos tortoise. It conveys such a sense of effort and determination that when it ap-



Piper Mouse (left) moves and stops when you toot on its whistle. This Movit detects sound with a sensor that includes a condenser microphone and printed circuit board.



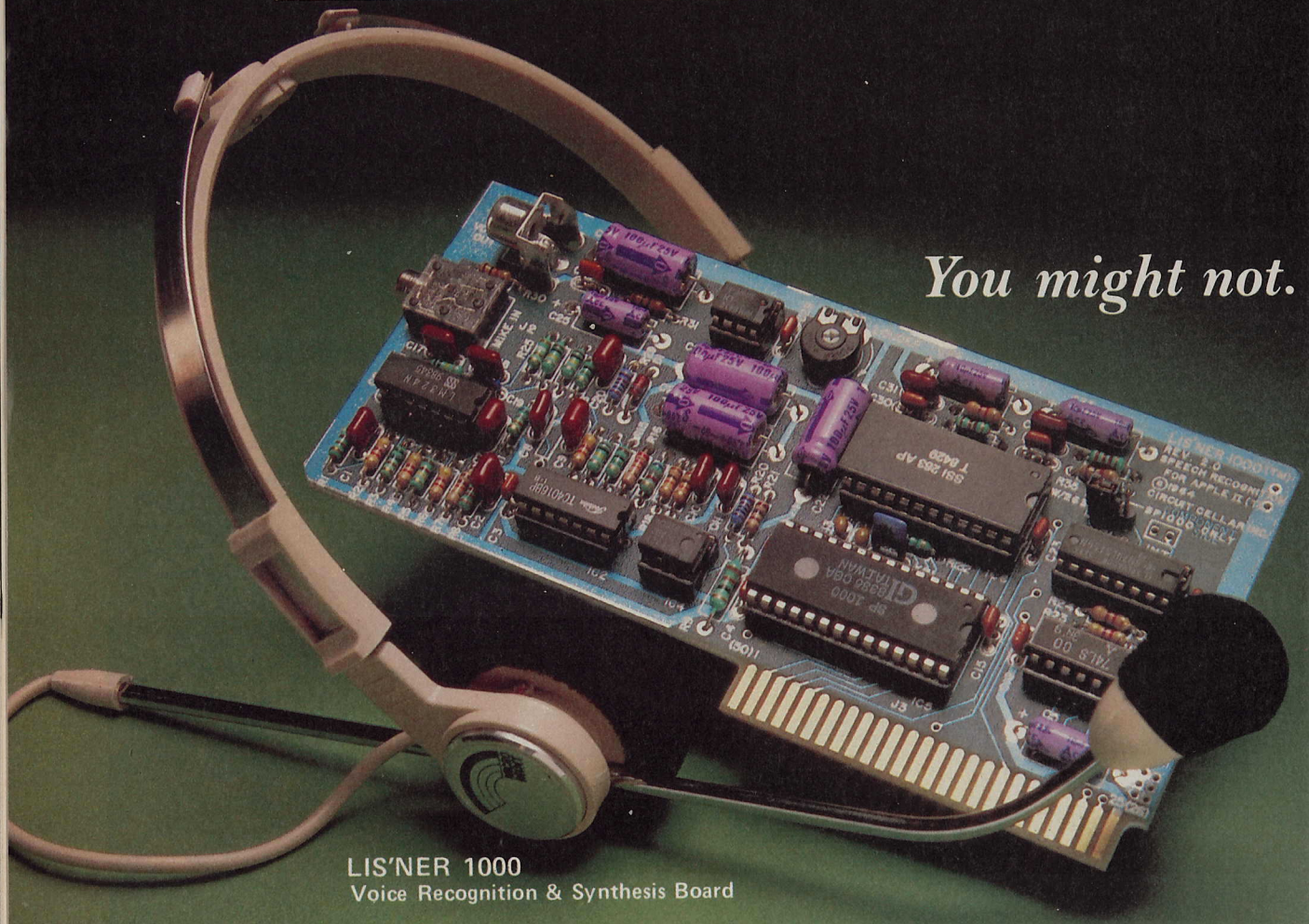
The tank-like Aavoider, with the aid of its infrared sensor and an electronic circuit, is clever enough not to walk into walls or run into party hats.



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INVASION OF THE MOVITS

proaches a paper party hat, we expect it to clomp right through. Instead, the robot delivers its coup de grace—it turns away, as if the object were concrete. It's hard not to respect a machine like that.

Movement is the key to the character of every Movit. Stationary, they're undistinguished. Ambling, shambling, rolling, or speeding, they acquire special personalities. The more I saw them in action, the more their peculiarities affected me. And some began to reveal more than just a sense of humor.

The Case of the Mystery Movit

One of the Movits—the Circular—possessed a certain mystery. The Circular even looks different from other Movits. Its domes bulge out sideways from two parallel wheels. Press one button on a remote control device and the Circular swivels wildly to the left or right. Press two, and you can steer it with complete accuracy—at least, so say the directions.

One evening we invited two friends, an engineer and his wife, to dinner. The engineer was especially intrigued by the Circular, partly because he could not figure it out immediately. Though it has two wheels and scoots along, the Circular does not roll. It always stays upright. Its motion was a puzzle. But my friend soon solved it. The batteries in the Circular ballast the center section, keeping it more or less upright. Yet each wheel has a black disk sandwiched inside it; these disks rotate independently of the rest of the Circular and send it swerving around the floor.

Having vaporized one mystery, my friend went on to a greater one: control of the Circular's movement. For most people, like myself, the Circular breathes life into the cliché "chicken with its head cut off." I could steer it just well enough to concede the possibility of control, yet for the most part it consistently surprised me with random new directions or collisions.

But engineers have a way with gadgets, and through some necromancy, my friend achieved total control almost at once. I watched amazed as the Circular moved straight across the room, turned twice, moved straight back, and generally performed with the precision of a figure skater. I asked for an explanation, and he said, with the innocence of the truly gifted, "Well, you just press both buttons!" When I pressed both buttons, you could take bets on which way it would end up facing.

We left the Circular, went into the living room, and began talking about other things. But the robot was not done with us. Suddenly we heard its distinctive whine, like a tiny vacuum cleaner. The Circular had come to life—it executed a few pirouettes in one direction, stopped, did a few in another, and stopped for a longer time. Then it did some serious spinning. The performance was eerie, as though the Circular were a toy out of E.T.A. Hoffmann's tale "The Nutcracker," venturing out of frozen immobility late at night, twirling around for the sheer joy of being alive. The cause was probably a loose connection, but I wouldn't fix it for all the seashells in the Seychelles.

CONTINUED ON PAGE 152

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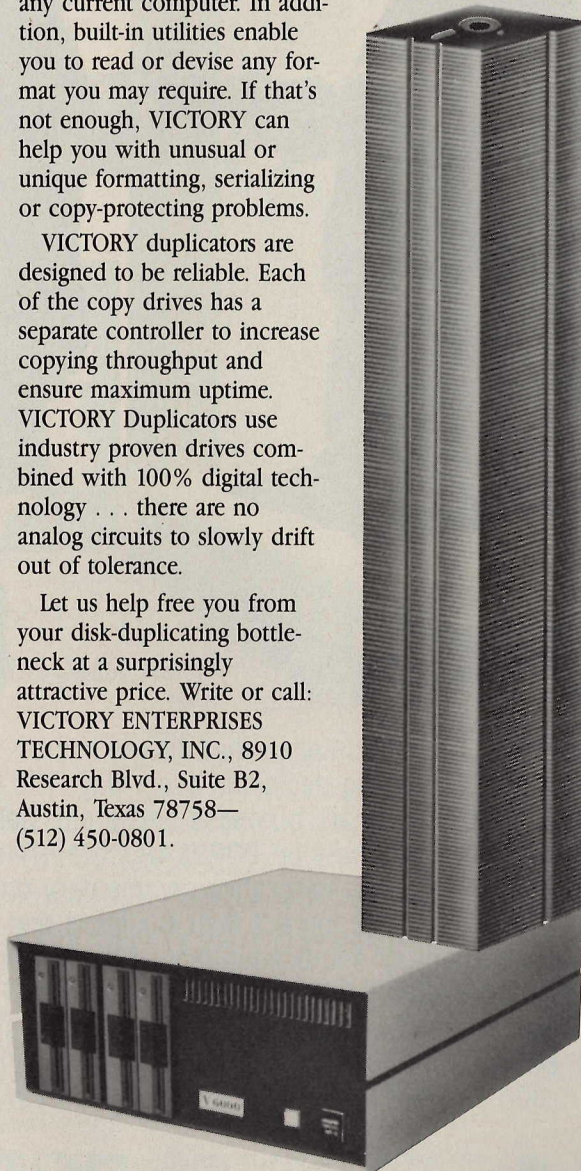
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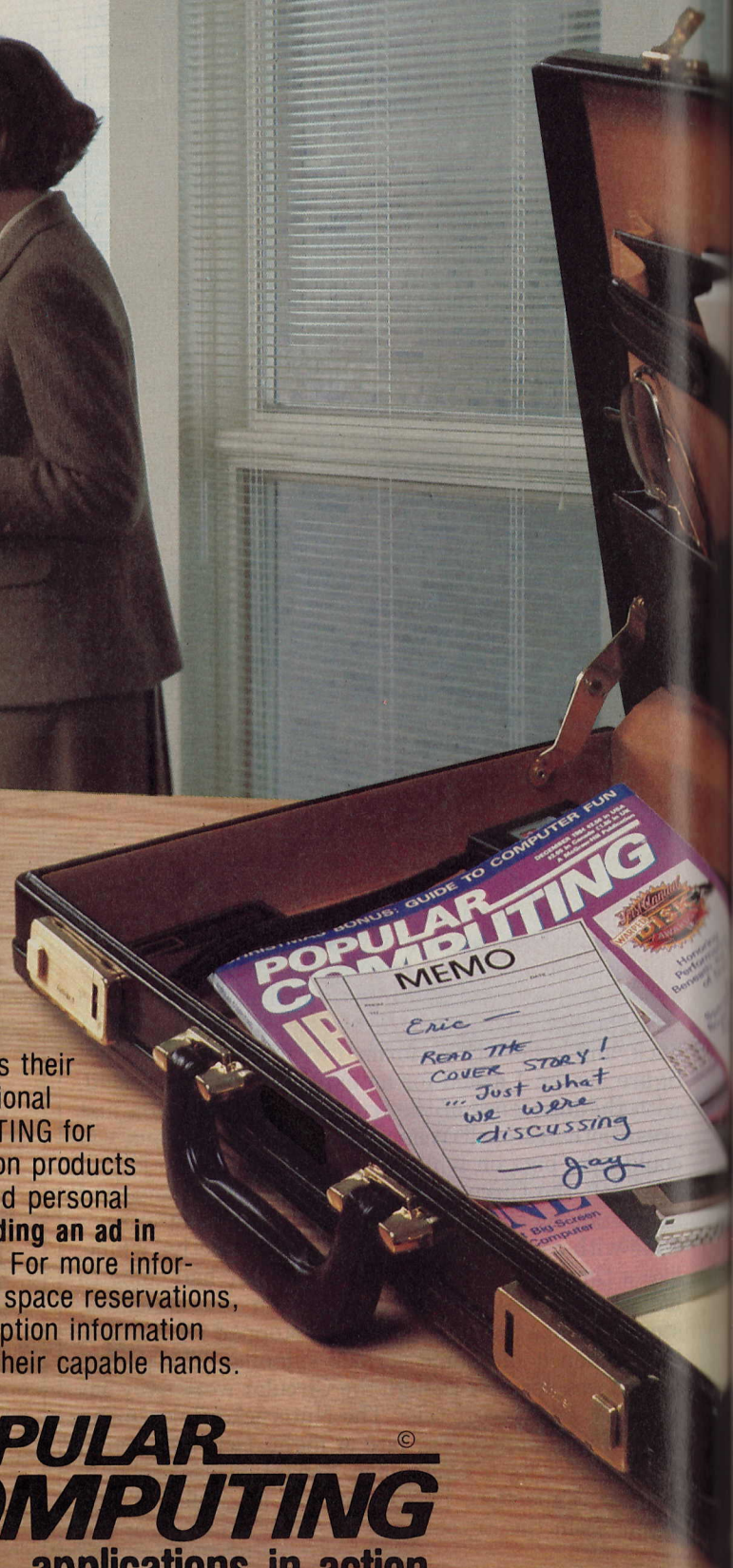


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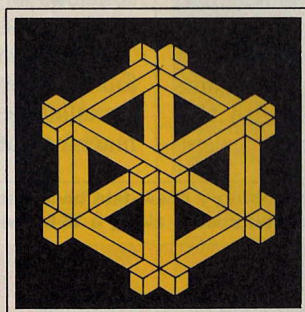
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A Beginner's Guide to Assembly Language

BY CY TYMONY



Part 1: An easy introduction to a powerful language

After hours of immersing yourself in BASIC programming, you've learned to write programs that print, sort, and perform math operations. But you're finding that sorting is tortuous and you can't print one program and type another at the same time.

The fault, however, lies not with your programming techniques—what you're able to do is limited by the way programs are executed in the BASIC language, which acts as a middleman between you and the computer. Although BASIC is relatively easy to learn, it insulates you from communicating directly with your computer.

Cy Tymony, author of *99 Fun-to-Make Electronic Projects* (Tab Books, 1981), lives in Culver City, California.

ASSEMBLY LANGUAGE

With assembly language, however, you can make your computer do things not possible with BASIC: execute lightning-fast graphics and high-speed sorts, print and run programs simultaneously, and enable incompatible computers to communicate with each other. You can also add new commands to your present language or operating system and produce more efficient ports for controlling external devices such as home-security and signal-monitoring systems. And bypassing BASIC means that you'll have all of the computer's memory available for your use. In short, assembly language gives you more direct control of the hardware capabilities of your computer and its peripherals.

This two-part article will introduce you to assembly-language programming and its world of computing power and time-saving features. The first part presents an overview of how assembly language works and explains its concepts and terms. The second part, which will appear next month, will offer assembly-language programs for Apple IIs, IBM PCs, and TRS-80 Models I, III, and 4.

Throughout this tutorial, we'll assume that you understand BASIC programming techniques. Learning assembly language is not as straightforward as learning BASIC with its English-like commands and built-in error messages that point you to your programming mistakes. Because of this, assembly-language programs take longer to write. But when you finish with this tutorial, you'll have a solid foundation in simple assem-

bly-language programming and a clear idea of how to proceed from there. Moreover, in the process, you'll become acquainted with how your computer operates from the inside out.

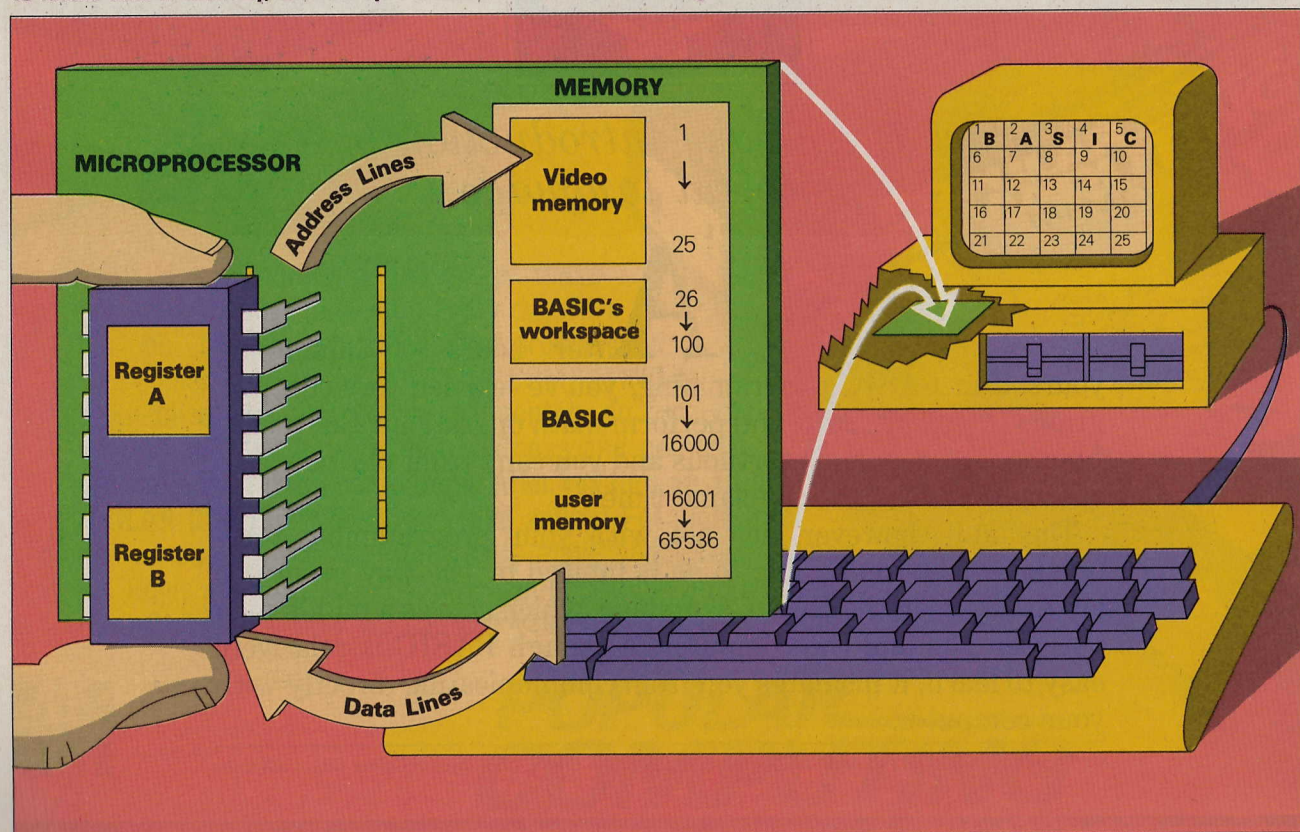
A BASIC Review

Compared to assembly language, BASIC uses memory inefficiently and operates slowly. Let's find out why. When you enter a line like 10 PRINT "A", BASIC translates the command PRINT and the character A into binary numbers that are equivalent to their standard ASCII codes and places them into memory locations or addresses. The location where your program starts is also stored in memory.

When you type RUN, BASIC must find the beginning of your program in memory, store the next line number to be executed (so it knows where to go after it finishes the operations in the current line), and store the current line number. Then BASIC gets the code number for PRINT, which directs it to call a subroutine. This routine consists of a set of binary instructions that tell the microprocessor to store the code for A at a location in video memory. The video circuits in the computer continuously scan this data in memory and will display an A at the proper location on the screen.

Every time it reads a program line, BASIC must follow this time-consuming procedure of retrieving and translating code numbers into binary instructions, or machine language, for the microprocessor. With as-

In this simplified computer, the microprocessor and memory pass data back and forth along an 8-bit-wide connection. To locate data in memory, the microprocessor sends addresses along a 16-bit-wide connection.



sembly language, in contrast, we use instructions that correspond directly to the machine language the microprocessor can recognize and manipulate. Thus the microprocessor can fetch data from memory and execute operations without requiring translation by BASIC or another intermediary language.

To eliminate the middleman, assembly language must use instructions based on the design of an individual microprocessor and the unique instruction set it uses to perform its arithmetic and logical processing functions. Consequently, assembly-language instructions vary from one kind of microprocessor to another.

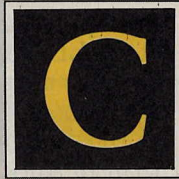
To illustrate how assembly language works in general, we'll refer to a simplified computer, dubbed the primer computer, that's equipped with BASIC and a pared-down microprocessor (see page 90). Keep in mind that particular instructions differ for real computers; the ones we use here are strictly hypothetical. But regardless of the microprocessor, all computers follow the same process to accomplish anything we instruct them to do: they fetch binary numbers from memory, manipulate them, and place them back in memory. (Throughout this discussion, we'll use numbers in familiar decimal form; for an explanation of binary numbers, see the box at right.)

Some Fundamental Terms

The primer computer has a 64K-byte memory (65,536 bytes that we can read or write to). The video memory area is addressed at locations 1 to 25. Each location in memory corresponds to a location on the screen. The computer's video circuits translate the codes at these addresses into the appropriate symbols (letters of the alphabet, numbers, blank spaces, and graphics) and display them on the screen. Memory locations 26 to 100 are BASIC's workspace area—here is stored data on where programs start and end, where the cursor is located on the screen, whether a key or joystick button has been pushed, and other functions that go on behind the scenes. Locations 101 to 16000 are reserved for the BASIC language. Locations 16001 to 65536 are the user memory available for our programs.

The microprocessor in our hypothetical computer has two registers, areas where data is stored while the microprocessor performs operations on it. (Real computers have more registers, most of which store only one byte of data.) The A register, called the accumulator, is the most important—operations can be performed on data moved into this register, and the results are temporarily stored or "accumulated" here. The B register is a general-purpose register that can store any kind of data, but no operations can be performed on data in this register.

When we want to access data in memory, we must use its address, a number from, say, 0 to 65536 that identi-



*ompared to BASIC,
assembly language runs
faster and gives you more control of
your computer's capabilities.*

fies its precise location. Typical instructions might tell the computer to "store the contents of register B in memory location 101" or "move the contents of memory location 101 into register A."

Of course, the microprocessor cannot understand in-

Bits, Bytes, and Binary Math

No matter what programming language you use, all data, instructions, variables, and addresses are ultimately converted to binary numbers so they can be stored in memory as bytes and manipulated by the computer. Programmers who use BASIC or another high-level language needn't be too concerned with the details of how this is accomplished. But because assembly language so closely parallels the inner workings of a computer, would-be assembly-language programmers ought to try to thoroughly understand the computer's processes.

While we say that computers manipulate only numbers, they actually act upon electrical signals that represent numeric data. In our primer computer, 16 address lines and 8 data lines connect the microprocessor to memory. Each of the eight data lines carries an electrical signal that can be either on or off. These on/off signals are represented by 1s (on) and 0s (off).

Each on/off line is one binary digit, or bit; all eight lines make up a byte. We can combine these 8 bits in a byte to represent any number from 0 to 255. Likewise, with 16 bits or 2 bytes we can represent numbers from 0 to 65,536.

Because the binary number system uses only two digits—1 and 0—it makes sense that computers use binary rather than decimal numbers to represent all data. In the binary system, each digit in a number represents a power of two, reading from right to left; thus, we write the decimal number 170 as 10101010 in binary code:

Decimal	128	64	32	16	8	4	2	1
Binary	1	0	1	0	1	0	1	0
	128 + 32 + 8 + 2 = 170.							

Once numbers are in binary form, it's simple for the computer to carry out its operations.

ASSEMBLY LANGUAGE

structions written in English sentences: it can deal only with instructions and data written in binary numbers, or machine language. These numbers, which are normally expressed in hexadecimal form (see "Hexadecimal Numbers" on page 150) correspond exactly to the microprocessor's instruction set. In other words, they tell the microprocessor to add, subtract, multiply, and divide data, to display and format characters on the screen, to handle input and output, and to carry out all other operations.

In assembly language, however, we need not write a program with a series of binary numbers. Instead, we write a program with abbreviations called mnemonics that represent the machine-language instructions.

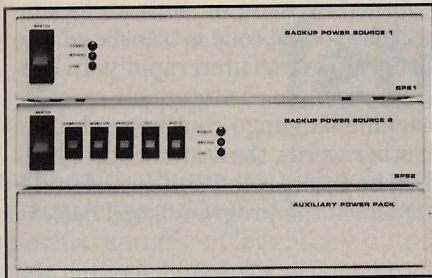
Mnemonics are contractions of words describing the microprocessor's operations; for example, ST means store, LD means load, and CMP means compare. (Most versions of assembly language use mnemonics such as those shown in the table on page 94.) It is much easier to construct and edit your programs with mnemonics than to work with machine-language codes for every instruction.

In an assembly-language program, a mnemonic is usually followed by an operand—data to be operated on or an address to be accessed. A mnemonic is sometimes preceded by a label, such as LOOP, which references the address of an instruction, a group of instructions, or a data storage area. Labels let us call different sec-

This sample assembly-language program for our primer computer displays the numbers 1 to 9 on-screen. For comparison, we also show the machine-language equivalent and the BASIC program that performs the same function. The simple technique illustrated by this assembly-language program is used in many sophisticated routines.

Machine-Language Program (Object Code)			Assembly-Language Program (Source Code)				Equivalent BASIC Program	
MEMORY ADDRESS	OPCODE	OPERAND	LABEL	MNEMONIC	OPERAND	COMMENTS	LINE #	STATEMENT
16001	43	49	START	LDA	"1"	LOAD REGISTER A WITH THE CODE FOR THE NUMBER "1" (49)	10	A = 1
16003	46	01		LDB	01	LOAD REGISTER B WITH THE ADDRESS OF THE FIRST LOCATION ON THE SCREEN	20	LOCATE 1,1
16005	53		LOOP	STA	(B)	STORE THE CONTENTS OF REGISTER A IN THE MEMORY LOCATION IN B (LOCATION ON THE SCREEN)	30	PRINT A;
16006	66			INCB		INCREMENT THE NUMBER IN REGISTER B		(The semicolon above tells BASIC to print at the next location.)
16007	63			INCA		INCREMENT THE NUMBER IN REGISTER A	40	A = A + 1
16008	45	58		CMPA	58	COMPARE THE NUMBER IN REGISTER A TO THE CODE FOR 1 + NUMBER "9" (57)	50	IF A <> 9 THEN GOTO 30
16010	70	16005		BNE	LOOP	BRANCH IF NOT EQUAL (IF THE ABOVE COMPARISON WAS FALSE, JUMP BACK TO LOOP. IF THE COM- PARISON WAS TRUE, PRO- CEED TO THE NEXT INSTRUCTION.)		
16012	80			RTN		RETURN TO BASIC OR OPERATING SYSTEM	60	END

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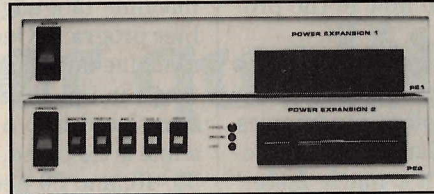
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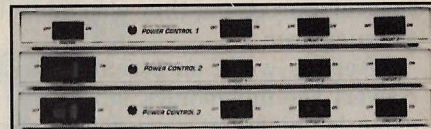
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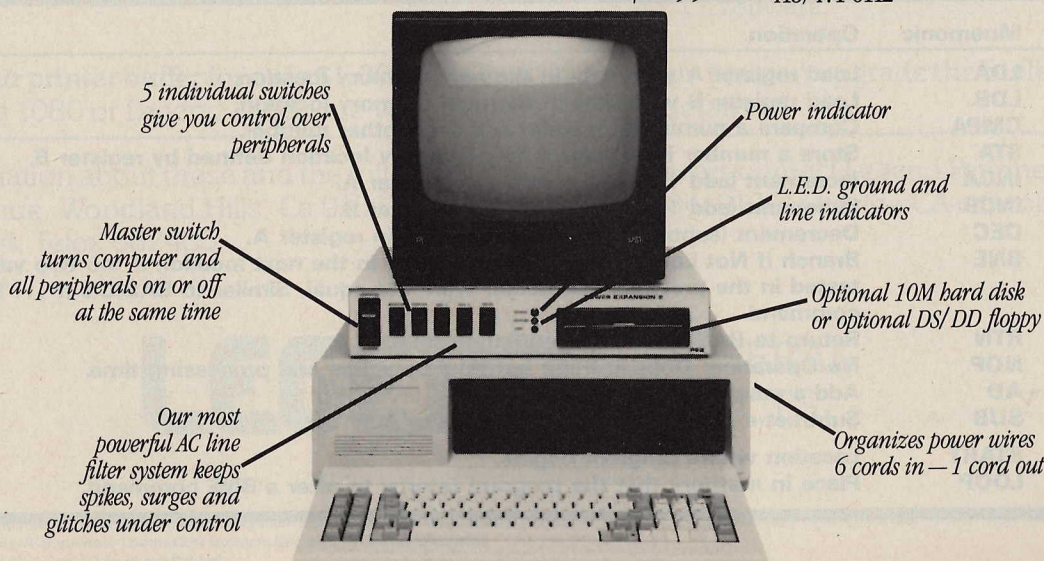
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ASSEMBLY LANGUAGE

tions of a program; they also make the flow of the program clearer.

After we write an assembly-language program, we convert the mnemonics, labels, and operands into machine language. It's possible to translate mnemonics manually by referring to the machine-language instructions for your microprocessor. But it's much faster, easier, and more accurate to use an assembler, a program designed to translate assembly-language instructions into machine language instructions and store them in the proper memory locations. For our primer computer and its very short sample program, we'll translate the instructions manually.

Anatomy of a Program

Now let's look at an assembly-language program (see the chart of program listings on page 92) that consecutively displays the numbers 1 to 9 on-screen. This program would run so much faster than its BASIC counterpart that the individual numbers would be blurs on-screen. We'd have to add delays to the program so we could recognize the numbers.

The chart is divided into three parts. The leftmost section shows the machine-language program, the middle section shows the assembly-language program, and the rightmost section shows the roughly equivalent BASIC program. As you can see from the chart, assembly language provides instructions on a very primitive or low level. Even the simplest arithmetic operation requires several instructions.

In the assembly-language program, mnemonics, operands, labels, and comments are called the source code. In the machine-language program, the opcode is the binary equivalent of the assembly-language instruction, or mnemonic. In our example, some instructions have no operand, and others have one operand. The format or syntax of instructions varies for different microprocessors.

The source code is translated into object code—

machine language—either by hand or with an assembler program. Once all the source code is translated, the machine-language program is executed rapidly. In contrast, in the BASIC program, each statement must be translated into a machine-language routine each time a line is executed. In other words, the statements in lines 30, 40, and 50 need to be interpreted and translated 9 times (the number of times the program loops back to line 30).

If we could look into memory, we would see that the machine-language program is loaded from address locations 16001 to 16012 (shown in the leftmost column). For example, the opcode 43 is stored at address 16001 and the operand 49 is stored at 16002. If we were to run the program, we would tell the microprocessor to go to the first location of our program and start executing the instruction at that address. We could start the process in several different ways, and we'll discuss them later. First, let's go through each statement line by line.

The program starts at address 16001 in memory. Our first step is to initialize register A with the first value we want to display on the screen. We accomplish that with the LDA instruction, which tells the microprocessor to load register A with the data (49, the ASCII code for "1") at the next location (16002).

Next, we want to get the address on the screen where the character will be displayed and hold that address in register B. We use the LDB instruction located at address 16003. This instruction is similar to the previous one except that it loads the data 01 (the first location on the screen) into register B.

Now we want to move the number to be displayed to the proper screen location. We use the STA instruction at 16005, which takes the contents of register A and stores it in memory at the address contained in register B; in other words, it actually prints the number on the screen. This instruction is only a single byte long because the operand is in register B. By using this type

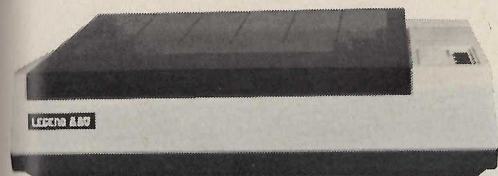
CONTINUED ON PAGE 150

Most computers use variations of the mnemonics listed here. For simplicity, the opcodes that correspond to the mnemonics are written in decimal form; normally, you'll see them written as hexadecimal numbers.

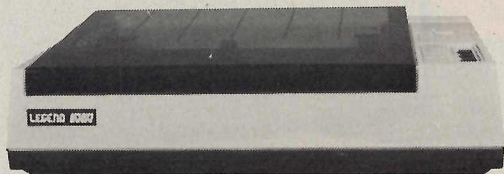
Opcode	Mnemonic	Operation
43	LDA	Load register A with data in the next memory location.
46	LDB	Load register B with data in the next memory location.
45	CMPA	Compare a number in register A with another number.
53	STA	Store a number in register A to a memory location defined by register B.
63	INCA	Increment (add 1 to) the number in register A.
66	INCB	Increment (add 1 to) the number in register B.
65	DEC	Decrement (subtract 1 from) the number in register A.
70	BNE	Branch if Not Equal: Go to the instruction in the next location if the two values tested in the previous instruction were not equal. Similar to BASIC's IF... THEN command.
80	RTN	Return to BASIC or the operating system.
90	NOP	No Operation. Does nothing but take up space and processing time.
100	AD	Add a number to data in register A.
110	SUB	Subtract a number from data in register A.
Labels:	START	Location where program begins.
	LOOP	Place in memory that the program returns to after a BNE command.

"...Damn near letter quality!"

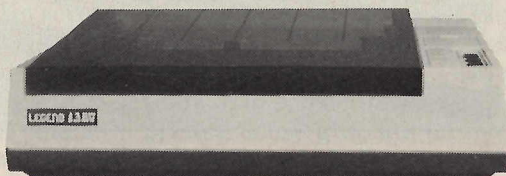
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The Integral

Hewlett-Packard introduces the first Unix transportable

by Rick Cook

On paper, Hewlett-Packard's new Integral looks like the thinking man's Macintosh. In addition to its Motorola 68000, high-resolution bit-mapped graphics, windows, optional mouse, 3½-inch disk drive, and transportable design, it also features Unix with multitasking, an electroluminescent display, and a built-in ink-jet printer.

And on the whole, the Integral is an excellent little computer. It is smaller and lighter than most transportables, although hardly in the same class as a laptop for portability. It is well designed and is certainly well made.

For all that, the Integral (code-named the "Pisces" during its development) is not for the people who buy the Apple Macintosh. It is not, in fact, for most personal computer buyers at all. It is a specialized product that HP has aimed at the market niches supported by "value-added" resellers and the scientific and engineering community, including students and university departments.

Like a lot of other HP products, the Integral is functional, rugged, high-quality—and high-priced. The Integral sells for \$4995 with a printer, 512K bytes of memory, and one built-in disk drive. That puts it about \$1000 above comparable MS-DOS machines, even allowing for the cost of the printer.

Rick Cook, who lives in Phoenix, Arizona, frequently writes for *Popular Computing*.



The Integral has an electroluminescent display and can be equipped with a mouse.

A Neat Little Package

Physically, the Integral is a nice little bundle. At just over 20 pounds it is lighter than most of the transportables. It is also smaller than most, thanks in part to the 3½-inch disk drive. One very nice touch is that the handle, unlike the chrome-and-corners contraptions on a lot of brands, is nicely contoured and padded.

The case is putty-colored plastic with numerous ventilation openings. It is rugged, but the setup guide warns you not to check it as airline baggage. The machine comes with an unpadded cloth dust cover. There is no shoulder strap and no provision

for one. Carrying handle or no, this thing would be murder to lug through any big airport.

Unlike most transportables, the Integral doesn't lie on its side to operate. It stands upright. Removing the lid exposes the built-in printer and lets you detach the keyboard from the front of the case. Actually, if you're not careful, it lets the keyboard fall off the front of the case. The keyboard is detachable and the cord is stowed in a trough along the top. With the keyboard off, you face the screen with the single microfloppy-disk drive to the right. Each disk holds 710K bytes of information.

HP offers several other storage

options, including dual 3½-inch drives, a 5¼-inch drive, and a couple of hard drives (the machine I used had only the single drive). But none of these optional drives is designed to fit into the Integral's case, and they tend to be expensive. The 15-megabyte hard drive, the smallest offered, is about \$3000. The Integral has two expansion slots on the back that are accessible without opening the case. Options for the slots include a 1200-baud modem (\$595) and additional memory cards.

The screen is an amber electroluminescent display similar to the one on the Grid Compass. However, at 4 by 8 inches, it is twice the size of the Compass's screen and has a resolution of 512 by 255 pixels. It is a full 25-line screen, and the characters are sharp. Its normal operating mode is black on amber, which makes it easy to read.

A switch below the disk drive lets you pivot the screen up to about an inch out of the case to adjust the viewing angle. Although the screen is not recessed and has no hood to shield it from glare, as there is on many transportables, the display stands up to glare quite well. Even a 100-watt desk lamp a foot from the screen didn't wash out the image.

At the back of the machine is the plug for power, a switch to set the computer for either American (120V 60-cycle) or British (220V 50-cycle) power, and a connector for the IEEE 488 peripheral bus. Although relatively uncommon on personal com-

puters, IEEE 488 is frequently used on test instruments and control equipment. HP is especially committed to it and offers it as the HPIB (Hewlett-Packard Interface Bus).

At the center of the back is another panel that gives access to the ROM pack holding the operating system kernel. This design makes it easy for value-added resellers to customize the system with their own ROMs and peripheral boards.

Printer, Mouse, and Keyboard

Built into the top of the Integral is an ink-jet printer that uses the same mechanism as HP's Thinkjet printer. (See *Popular Computing*, December 1984, page 110.) Although there was some smearing when I printed dense graphics on the test unit, the text was always extremely

sharp, clear, and easy to read.

The printer works best with special absorbent paper, but not all computer or forms dealers offer the paper. The sides of the printer compartment fold down, so loading paper and changing print heads is fairly simple.

Probably the biggest advantage of the ink-jet printer is that it is much quieter than a dot-matrix printer. The only sound from the machine when it is printing is the print head sliding back and forth.

The optional HP mouse is another high-quality item. It plugs into the front of the machine with a telephone-type jack and works even on a slick surface such as a plastic-coated desktop. The Integral's response to mouse movements is lightning fast and very precise.

AT A GLANCE: Hewlett-Packard Integral (Pisces) Personal Computer

Manufacturer:	Hewlett-Packard, Portable Computer Division, 1020 NE Circle Blvd., Corvallis, OR 97330; (408) 257-7000, ext 4805
Users:	Value-added resellers; scientists and engineers; universities
Standard Features:	68000 microprocessor, 512K bytes of RAM, one 710K 3½-inch disk drive, high-resolution electroluminescent display with bit-mapped graphics, ink-jet printer, HPIB interface
Software Included:	Subset of HP-UX (Unix) command disk, C compiler, utilities disk, and a standard applications disk that includes a graphics program and a font design program
Options:	HP mouse (\$195), 256K-byte RAM card (\$695), 512K-byte RAM card (\$1495), 300/1200-baud modem (\$595), 3½-inch single floppy-disk drive (\$965), 3½-inch dual floppy-disk drives (\$1270), 5¼-inch single IBM-formatted floppy-disk drive (\$1200), 14.8-megabyte hard-disk drive (\$3040), hard-disk drive with a 3½-inch floppy-disk drive (\$3345), HP-UX Development System (available soon)
Base Price:	\$4995

The keyboard is less successful. It is well made and has a full complement of keys, including a row of 15 function keys across the top. The key layout is like that of the Selectric typewriter, with the Shift next to Z. But it is rather cramped, making it easy to hit the wrong key. The layout would have been improved if HP had used some of the space now given over to storing the keyboard cord, to expand the key area.

bytes of hard-disk storage, and most people consider about a megabyte of RAM necessary for real work with the operating system. True, the Unix kernel is fairly small, but what makes Unix Unix is the collection of utilities and functions that comes as part of the system. About 100 utility programs make up the core of Unix, and various implementations offer anywhere from 50 to 150 additional utilities.

You can run Unix on the Integral provided you interpret the phrase "run Unix" liberally. What you're really able to do is run Unix applications.

A Unix Machine?

The Integral is based on Unix, the minicomputer operating system developed at AT&T's Bell Labs, which is now appearing on the larger personal computers. Unix is a big, complex operating system with numerous built-in features, and according to AT&T it is the operating system of the future.

The Integral is one of the smallest, least costly machines yet to run Unix—provided you interpret the phrase "run Unix" liberally. It will run Unix applications, but you can't interact with Unix on the Integral the way you can use MS-DOS or PC-DOS on an IBM PC.

The Integral comes with the kernel of HP-UX, HP's version of Unix, in ROM. The company supplies the utilities and functions that make up the balance of the system on 3½-inch floppy disks. The three disks supplied with the computer contain commands, utilities, and standard applications. Some of the utilities, functions, and other programs that also make up Unix are available as part of an extra-cost package. The idea is that you copy the commands and utilities you need onto your applications disk before use.

In practice, it's hard to take an arrangement like this as a serious Unix machine. A full Unix implementation usually takes 5 to 8 mega-

The problem of Unix's size is exacerbated by the nature of its utilities. The Unix philosophy calls for one utility for each simple task. The idea is that you will string together simple utilities to custom-make tools for each job. This is an admirable and powerful concept, but it doesn't work very well when your utilities are spread over three or four disks and your files are on yet another. Anyone who really tried to use Unix on a base-model Integral would be in for a lot of disk swapping, at the very least.

There is another problem with Unix, and that is its file system. Because Unix is structured to handle very large amounts of memory and hundreds of files, you can easily get lost in its maze of file directories. On a machine the size of the Integral the file structure is unnecessarily complicated. Unix has the capability to support alternate command structures (called "shells") and provides some very powerful tools for generating them. But HP did not choose to provide an alternate command structure that would be easier for those not familiar with Unix.

An added fillip to the Integral is the nature of HP-UX itself. It is based on Version III Unix and includes a mixture of Version V and Berkeley Unix. This sort of pick-and-choose approach to Unix has its good points. It means, for example,

that you get both the "vi" text editor from the Berkeley implementation and the "ed" from Version V, but it also means some conversions for applications programs are needed.

The list of utilities supplied with the Integral also has some odd omissions. Perhaps the oddest is "uucp", the standard Unix communications utility. This omission means that it would be difficult for an Integral user to exchange files and data with standard Unix systems. According to HP, however, "uucp" is available as an extra-cost option.

If you want to use Unix for software development on the Integral, you need additional hardware and the extra-cost HP-UX Development System. The minimum recommended hardware is an Integral equipped with an external 15-megabyte hard drive and an extra 256K bytes of memory. However, at that point the price is nudging \$10,000, and all pretense of portability is gone.

The reason for this rather odd implementation of Unix is partially the Integral's intended market and partially the lack of compelling alternative choices for an operating system. According to HP, the purpose of Unix on the Integral is to allow value-added resellers to develop applications under Unix and supply both software and computers to their customers as a package. This is practical because the end user would be getting essentially a ready-to-run system, and the reseller would take care of the problems of seeing that the right utilities are on the disks and constructing the user interfaces.

The other reason for choosing Unix may have been the hardware—specifically the 68000 microprocessor. MS-DOS, the most popular operating system for 16-bit micros, won't run on the 68000 and there is no outstanding alternative. The 68000 can run Unix, so the attraction of offering the system on the Integral was considerable.

Software

The Integral comes with a tutorial disk, an applications disk, three

disks of HP-UX utilities and commands, and a diagnostic disk. Also supplied with the machine is HP's Personal Applications Manager program (PAM), similar to that found on the HP Touch Screen. PAM is a user interface to the applications software and operating system that is designed to make the machine easier to use.

But PAM's terminology is rather idiosyncratic. On most systems that use the desk metaphor, such as the Macintosh, a "folder" represents a file. On the Integral, it's a directory. A file is called a file. Also, the Integral documentation uses the term "RAM disk" not just for setting aside an area in random-access memory to act as a high-speed disk emulator, but for storing any program or data file in RAM.

PAM uses a combination of overlapping windows and Unix notation to indicate what is going on. When the Integral comes on, the first thing you see after you get past the copyright message is the PAM window. At the top is a command line and below that is the disk directory.

When you open a file, a new window is laid over the PAM window. As you move through the directories and programs, the labels of eight function keys change appropriately. The labels appear in a series of boxes across the bottom of the screen.

Since HP-UX is a multitasking system, the Integral can run several programs at once. After a program starts, it can be shifted to the background and continue running while you go on to something else. Only one program can be connected to the keyboard at a time, and that is usually the program running in the foreground window. In fact, HP-UX can run several copies of the same program, such as a spreadsheet, at once.

The applications programs include a text adventure, a font designer, and a very nice graphics program. With the font designer, you can create specialized alphabets. The program is so simple to use that the first time I sat down with it, I amused myself by designing a Cyril-

lic character set so I could print Russian text. It took me less than a hour to get the font properly set up. The program's biggest use, however, will probably be generating the special symbols needed for scientific and engineering applications.

The graphics program is also fun to play with. It isn't as complete as MacPaint. You cannot define a shape and move it as a unit, nor does it offer the variety of line widths and

those already familiar with the main files on other Unix systems will feel at home here. The rest of us are going to have to struggle with the cryptic explanations, lack of examples, and general terseness of the documentation. If you think the MS-DOS manuals are bad, wait until you try to figure this one out.

Who Is It For?

If the Integral, like the Apple

The font designer program is so simple to use that I was able, in an hour, to create a Cyrillic character set for printing text in Russian.

borders the Macintosh has, but it has about two dozen texture patterns, predefined shapes that can be moved, enlarged, and rotated with the mouse, and line-drawing abilities. The program also has a very nice undo function for those times when your shading leaks out of an improperly closed figure.

In operation, the applications software was fast and generally performed as expected. Programs took longer to load than similar-size programs do on an IBM PC, but the lag wasn't objectionable.

Documentation

The Integral comes with both printed and on-line documentation. The setup guide in the printed portion includes a nice touch—it was done almost entirely in pictures.

The on-line documentation was, with one major exception, excellent. The machine comes with a tutorial disk designed to lead you through the business of using the computer and its file structure. Since the Integral is a multitasking system using tree-structured directories and windows, you have a lot to learn. The material is broken up into easy-to-manage chapters, and the tone, while on the simple-minded side, is neither intimidating nor cute.

Unfortunately, you can't say the same for the file that purports to explain the Unix commands. Only

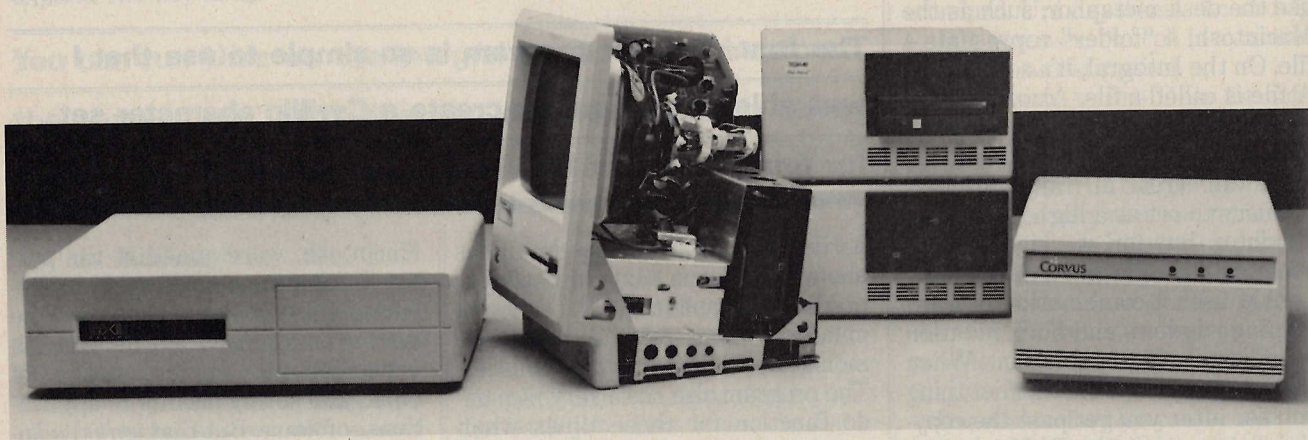
Macintosh, were aimed at the personal computer market, Hewlett-Packard would have a problem. The system is expensive, burdened with a cumbersome implementation of Unix, and sorely lacking in applications software. But that isn't the Integral's market at all.

According to HP, the people who will want to buy this computer fall into two categories: they will be technically trained (scientists, engineers, and computer science and engineering students) and willing to cope with its peculiarities, or they will be buying from intermediate sources who have taken the time and effort to make sure the applications are sufficiently friendly and to support them properly. About the only thing missing from the list of trendy features is pull-down menus, and they could be added without too much trouble.

For the technical types, the transportable Integral has no competition. If you are already familiar with Unix, as more and more scientists, engineers, and students are, the system is easy to learn. And, for value-added resellers, the Integral offers the building blocks for the kind of user-friendly interface that average customers expect in a computer. Indeed, given the right software, the Integral has a lot going for it in the special markets the resellers serve. □

Hard-Disk Drives for the Mac

Four new systems are fast, but not without flaws



by Michael J. Miller

Apple's Macintosh is supposed to be an easy-to-use computer. But many users complain that its single microfloppy-disk drive is too slow and too limited in capacity, resulting in "disk full" messages and constant disk swapping.

Of course, Apple's optional second disk drive solves some of these problems by adding another 400K bytes of storage. But a hard-disk drive offers even more advantages. Depending on the capacity of the disk, hard-disk drives can store between 5 and 40 megabytes of information; a typical 10-megabyte hard disk stores the equivalent of about 25 floppy disks. Because you can probably fit all your data and put most of your programs on the hard disk, you should rarely have to swap disks. And a hard-disk drive is nearly always much faster than a floppy-disk drive.

Therefore, using a hard disk with a Macintosh should be terrific. In tests of four leading Macintosh hard disks, I found they were indeed faster and more convenient. But

while speed and capacity are important issues, equally important is how well a hard-disk drive works in Macintosh's unique operating environment. Unfortunately, Apple did not design the Macintosh's operating system and Finder (the part of the operating system that keeps track of files on the disk and creates the desktop) to support hard-disk drives, instead leaving this support to the drive vendors.

As a result, using a hard-disk drive does not always match up to expectations—at least not with the current generation of Macintosh software.

The systems I tested included external hard-disk drives from three well-known suppliers of computer peripherals—Corvus, Davong, and Tecmar—as well as a prototype version of General Computer's Hyperdrive, an internal hard-disk drive.

These manufacturers offer hard disks in a variety of configurations at prices ranging from \$1795 to nearly \$5000. Tecmar offers either a 5-megabyte removable cartridge or a 10-megabyte fixed disk for \$1995

Four manufacturers of hard-disk drives for the Macintosh: (above, left to right) Davong, General Computer (installed Hyperdrive), Tecmar, and Corvus.

and a single unit with both types of storage (where you would use the cartridge unit for backup) for \$3290. Corvus offers 5-megabyte (\$1495), 11-megabyte (\$1995), 20-megabyte (\$2995), and 45-megabyte (\$4995) versions. Davong offers 10-megabyte (\$1950), 21-megabyte (\$2795), 32-megabyte (\$3395), and 40-megabyte (\$3995) versions. A Hyperdrive, which includes a 512K-byte memory upgrade, costs \$2795 installed; for those who already have 512K Macs, the hard-disk drive without memory costs \$2195. For comparison, a second floppy-disk drive costs \$495, plus \$4 to \$6 for each disk.

Connecting the Hard-Disk Drives

Developers find it difficult to use the Macintosh's external drive connector because of the unusual circuitry of the disk controller. As a result, all of the external hard-disk drives connect to the Macintosh

through the modem port.

The arrangement causes problems if you want to use a modem. To telecommunicate, you must either disconnect the drive or connect the modem to the printer port. Unfortunately, most telecommunications programs were designed to work best using the modem port. Alternatively, the Davong drive can be connected to the printer port, but that causes trouble when some programs try to print. The ideal solution would be a third port, but Apple didn't include one.

Instead, the hard-disk drive manufacturers could give you another modem port on the back of the hard disk; in fact, the Tecmar unit has such a port. But Tecmar doesn't yet offer software that lets you use this extra port, though the company promises it will be available soon.

Booting Problems

Using a hard-disk drive connected to Macintosh's modem port presents even more unusual problems. With most other computers, you can start (boot) the computer's operating system from the hard-disk drive. But on the Macintosh, you must start from a floppy disk with special files (supplied by the drive manufacturer) that tell the machine to look to the modem port for the hard disk.

On other computers, you can also select the hard-disk drive as the system's primary, or default drive. But Macintosh's Finder chooses what it calls the "start-up disk" based on the last disk with system tracks that it searched for a program. This start-up disk contains necessary information, including fonts, icons, the scrapbook, and the Finder itself.

Of course, you can (and should) put the system tracks on the hard-disk drive so it can be used as a start-up disk. But when you run a program from a floppy-disk drive, it often becomes the start-up disk again.

For instance, when you first turn on the machine, the system designates the floppy as the start-up disk. To make the hard disk the start-up

disk, you must start an applications program from the hard disk, then immediately exit. As long as you then run programs from only the hard disk, the hard disk will continue to remain the start-up disk.

The Hyperdrive gets around some of these problems because it connects directly to the main circuit board inside the computer, allowing you to boot from the hard drive. Effectively, you send General Computer your Macintosh (or take it to a dealer); the firm adds a 10-megabyte hard-disk inside the case and upgrades your user memory to 512K

able space on it—a message indicating that you have 5000K or 10,000K bytes of disk space left is not uncommon. Unfortunately, these messages are deceptive, as you often reach other limits before running out of disk space.

First of all, files take up more space on hard disks. Each hard-disk drive allocates disk space in larger chunks than the Macintosh uses with floppy disks. As a result a file that takes only 1K bytes on a floppy disk will take 4K bytes on a Corvus or General Computer drive, 5K bytes on a Davong drive, and 10K

AT A GLANCE: Macintosh Hard Disks

Manufacturers:	OmniDrive • Corvus Systems Inc., 2100 Corvus Dr., San Jose, CA 95124 (408) 559-7000
	MacDisk • Davong Systems Inc., 217 Humboldt Ct., Sunnyvale, CA 94089 (408) 734-4900
	Hyperdrive • General Computer Co., 215 First St., Cambridge, MA 02142 (617) 492-5500
	MacDrive • Tecmar Inc., 6225 Cochran Rd., Solon, OH 44139 (216) 349-0600
Uses:	Mass storage device for the Macintosh; replaces floppy disks and increases speed
List Prices:	Corvus: 5-megabyte \$1495, 11-megabyte \$1995, 20-megabyte \$2995, 45-megabyte \$4995
	Davong: 10-megabyte \$1950, 21-megabyte \$2795, 32-megabyte \$3395, 40-megabyte \$3995
	General Computer: 10-megabyte internal disk with 512K-byte memory upgrade \$2795, disk alone \$2195
	Tecmar: 5-megabyte removable cartridge or 10-megabyte fixed disk \$1995, combination 10-megabyte fixed disk with back-up cartridge \$3290

bytes. And the Hyperdrive leaves your ports free for a modem and printer. Though you no longer have to start the system from a special floppy disk, you still have the problem of the start-up disk changing when you run a program from a floppy-disk drive.

All of the drives would be easier to use if Macintosh allowed for the equivalent of a CP/M or MS-DOS "autoexec" file, which issues a pre-programmed series of commands when you turn on the computer.

Files and Volumes

When the system finally recognizes the drive, the Macintosh displays its desktop with lots of avail-

bytes on a Tecmar drive.

Second, the Macintosh creates its desktop based on a list of files it stores in a portion of RAM, and the number of files you can have is limited. Apple does not specify an absolute limit on the number of files because the amount of memory each file uses varies by such things as the length of its name; in practice, however, you can usually store somewhat more than 100 files.

The number of files you have also affects the speed at which Macintosh can draw its desktop; the more files you have, the slower the Macintosh responds in opening files and restoring the desktop after you run an applications program. As you approach

Michael J. Miller is a West Coast editor of *Popular Computing*.

the limits of its file capacity, the machine slows down noticeably.

While you can divide your Macintosh files into separate file folders, making the desktop *appear* less crowded, the Macintosh continues to keep track of all items within the folders. Unfortunately, the Macintosh does not have a hierarchical file system (such as that used in MS-

hard disk and run from there.

Many copy-protected programs can also be put on the hard disk. With some of those programs, such as Living Videotext's Think Tank 128, the original floppy disk remains in the floppy drive as you run the program. With others, such as Microsoft Chart, the Macintosh asks you to insert the original disk,

on the Corvus hard disk, I learned that Life in this case meant death; the system froze and I was forced to start over.

Reliability and Comparisons

I encountered some problems with the drives. When the Tecmar cartridge drive neared the limit of files it could store (at about 120 files), it showed problems storing files correctly—to the point that it crashed while sorting a large file. But all was not lost. I was able to copy the file onto a floppy disk, and after erasing other files from the desktop, replaced it on the hard disk. Afterwards, the file worked fine.

To test the speed of the hard disks, I tried a typical application—sorting through a large database. I used the PFS:file program because it sorts through records sequentially, so that the time it takes to sort is directly related to the speed of disk access.

A search for a nonexistent record in a file of 705 records took the Tecmar cartridge drive 32 seconds, the Tecmar fixed-disk drive 30 seconds, the Corvus drive 26 seconds, the Davong 19 seconds, and the Hyperdrive 16 seconds. For comparison, the same test took 87 seconds using an external floppy-disk drive.

With more records the difference became more apparent. Tecmar's cartridge drive searched through a 1390-record file in 63 seconds, while its fixed drive took 58 seconds. The Corvus drive did the same search in 52 seconds, the Davong took 37 seconds, and the Hyperdrive did the job in 31 seconds. Using an external floppy-disk drive was much slower at 3 minutes and 8 seconds.

Other tests came up with similar results. In sheer speed, the Hyperdrive was fastest, followed closely by the Davong and the Corvus drives, while the two Tecmar drives trailed behind. It's not surprising that the removable-cartridge-based Tecmar drive was the slowest unit tested, as that technology is typically slower than fixed disks.

All of the hard-disk drives were much faster than floppy drives, and all were certainly more convenient

In sheer speed, the Hyperdrive was fastest, followed closely by the Davong and Corvus drives, while the two Tecmar drives trailed behind—not surprisingly—as that technology is often slower than fixed disks.

DOS 2.0 or later); thus it still looks into unopened folders.

One way around the file limitation problem is to partition the hard disk into several "volumes" so that each volume functions like a separate disk. With volumes, you get some of the advantages offered by hierarchical systems. You can store many more files on the hard disk, thus using all its space. And you can reduce the number of files on the desktop at any one time by displaying only one volume, making the system respond more quickly. Using volumes also helps keep your files in order, so you see only the files you are interested in. For example, you could keep all your word-processing documents in one volume and all your database files in another.

On the down side, having volumes is more like using floppy disks—you have to continually switch between them.

At the time of this writing, only the Corvus drive came with software that supports volumes. The other companies, however, had similar software in advanced-development stages.

Running Applications Programs

Many Macintosh programs worked especially well with a hard disk. MacWrite, MacPaint, and most programs that are not copy protected can be transferred easily onto the

checks it, and then immediately ejects it.

This "key disk" arrangement may not be optimal, but it's familiar to anyone who has used copy-protected software with a hard disk on an MS-DOS computer. And even with such a key disk arrangement, with most programs you still benefit from the hard-disk drive's improved speed.

Forethought Corp.'s Factfinder, a free-form database manager, offers a better solution. Its copy-protection scheme lets you install the program on either a Davong or Tecmar drive, eliminating the need for key disks.

Other copy-protected programs cause more troubles. Microsoft's Multiplan gets lost looking for the key disk on the Tecmar, Corvus, and General Computer drives, sometimes asking you in effect to insert the hard disk into the floppy-disk drive—a request I found intriguing. And some programs like the PFS series simply can't be copied to the hard disk, forcing you to execute those programs from the slower floppy-disk drive.

Several other problems occurred as I tried to run different applications programs on the hard-disk drives. Some programs simply do not work on certain drives, though I don't really know why. (The developers aren't too sure, either.) For instance, when I tried to use a popular public-domain program called Life

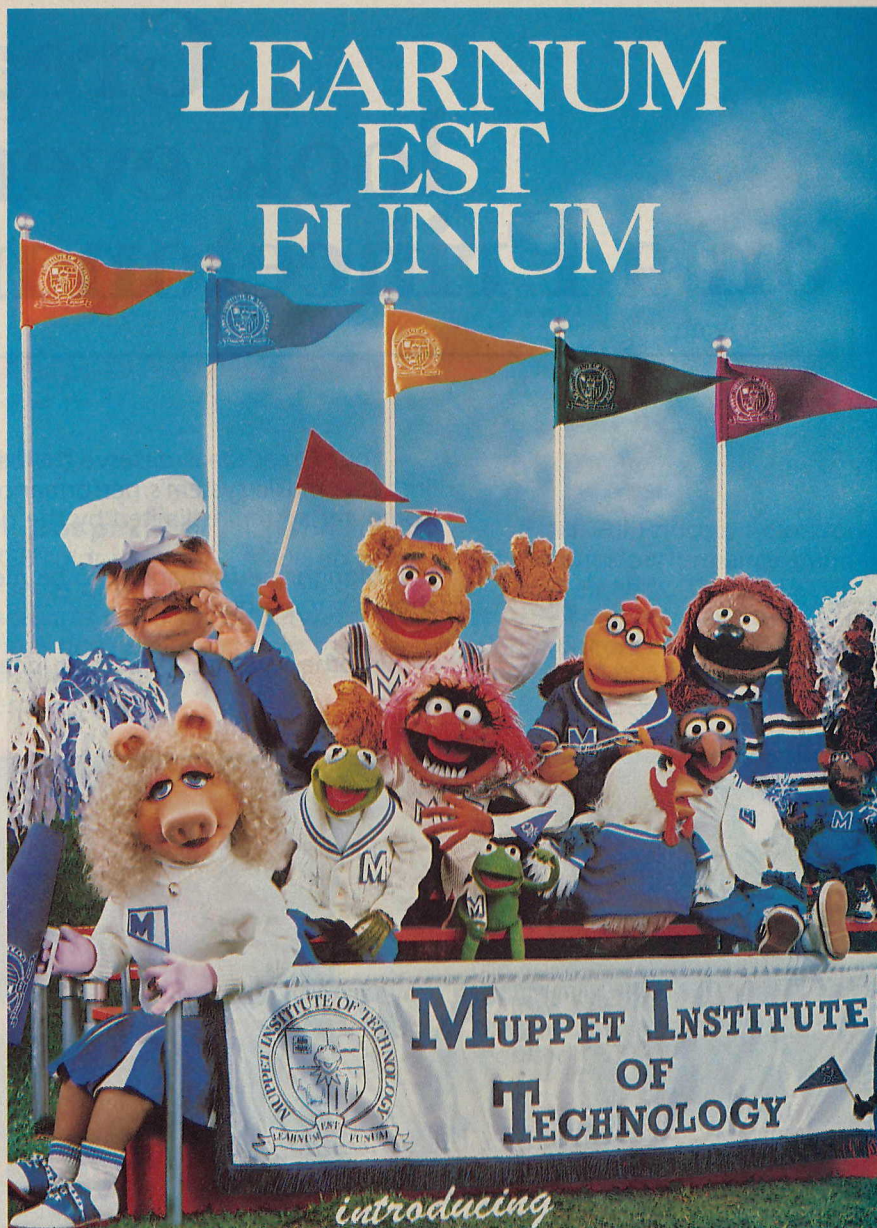
to use than a stack of floppy disks. Also, each drive has a notable advantage. The Hyperdrive promises good software (though the prerelease version had some bugs) and was the fastest and most convenient. However, installing a Hyperdrive voids the Apple warranty and will probably drastically reduce the number of places you can take your Macintosh for service. The Davong drive was the fastest external hard disk in our tests. Tecmar's removable-cartridge technology lets you have the equivalent of several different hard-disk drives; and its additional modem port may make the drive more convenient to use while telecommunicating. And the Corvus has some interesting utility programs such as back-up routines. Corvus has announced plans to let several Macintoshes share a hard disk and other peripherals through its Omninet network.

Still, none of the drives worked as well as I had hoped. You should be able to start from a hard disk, have an autoexec file, and run applications without the Finder getting lost and switching start-up disks. These are mainly software problems and may be solved by a new version of the Finder that Apple plans to introduce later this year, concurrent with its own hard-disk drive file server. In the meantime, the hard-disk drive manufacturers are looking at the problems and plan updated software of their own.

Beats Swapping

Despite their problems, I would much rather use a hard-disk drive than continually swap floppies. And if you switch between programs often, or have large amounts of data, a hard-disk drive is much more convenient than a second floppy drive and stacks of floppy disks.

But many of the current problems using hard-disk drives will be especially disconcerting to users not already familiar with computers—supposedly Macintosh's target audience. For this group, I'd have to say the hard-disk drives are simply not ready. □



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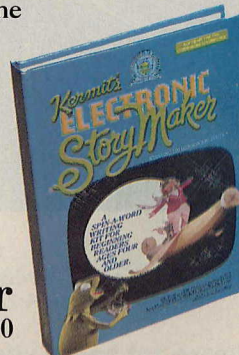
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Commodore 64 and Apple II, II+, IIe, IIfx versions are available wherever software is sold.

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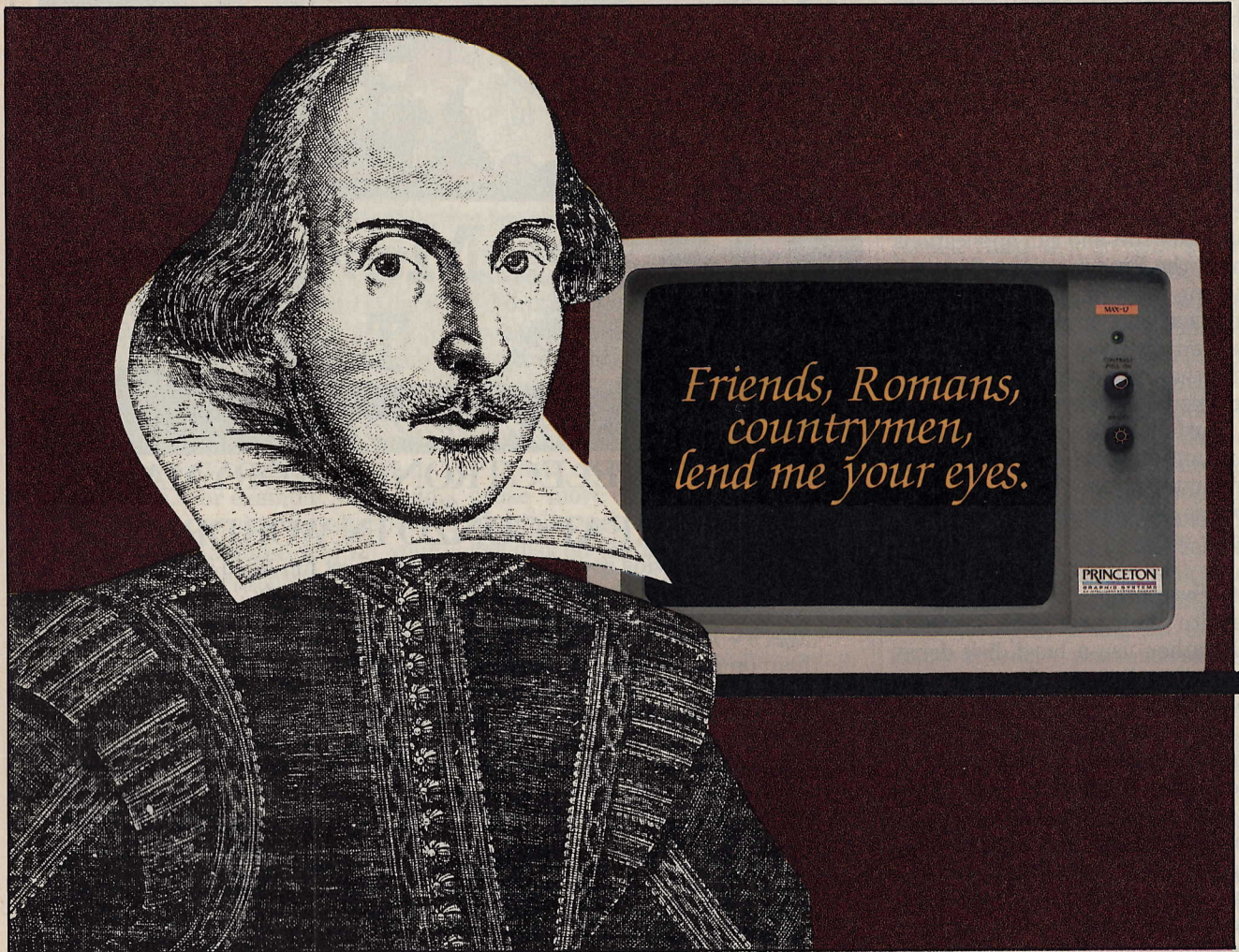


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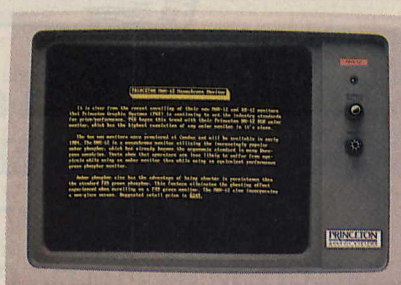
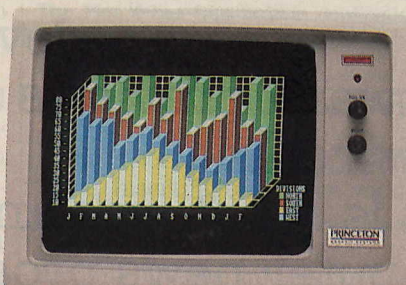
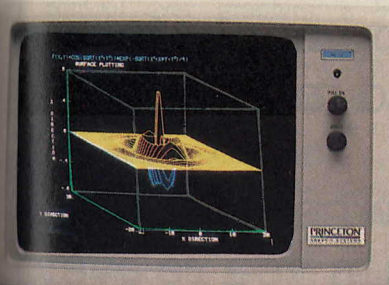
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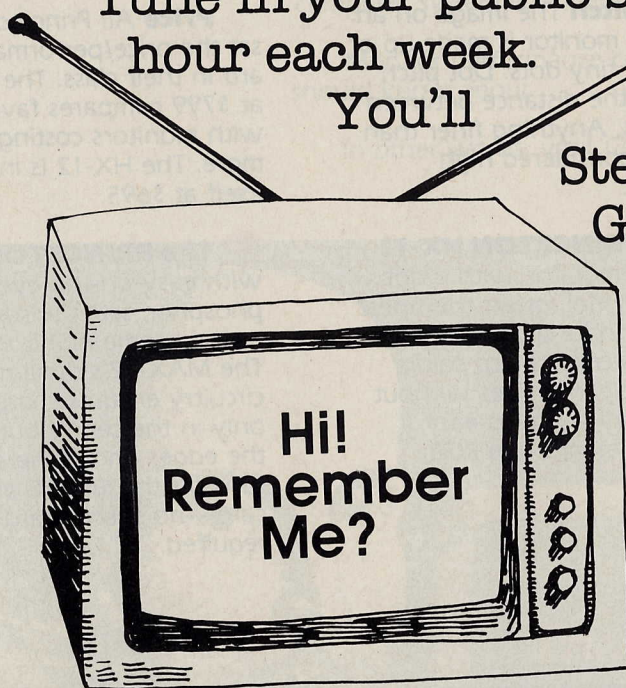
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The Commodore Plus 4

Will the new productivity machine knock out the Commodore 64?

by Ken Wildman

When the long-awaited home computer shakeout arrived, the low-end, under-\$300 market saw only one real winner—Commodore. Now a challenger to the Commodore 64, the Plus 4, has been introduced by none other than Commodore itself.

The Plus 4 sells for \$299 and includes 64K bytes of RAM (random-access memory), a graphics resolution of 320 by 200 pixels with 128 colors, an enhanced Commodore BASIC (version 3.5), some windowing capabilities, improved software control over graphics, a built-in machine-language monitor utility, and built-in productivity software.

Probably the most highly touted feature of the Plus 4 is the applications software stored in ROM, which includes word processing, spreadsheet, graphics, and file management. Commodore calls the Plus 4 a "productivity machine" because of this software, aimed at "the more sophisticated, high-end home user."

Word Processing

According to the *Integrated Software Manual* the word processor contains the "essential features found in all word processors." While the word processor has 20 editing commands and 18 formatting commands, this power hardly seems worthwhile when you consider the total capacity of this program—only 99 lines of text.



The Plus 4 has four built-in applications programs.

To make matters worse, some very important features leave much to be desired. For example, the insert mode is not only unique but cumbersome. Inserting text in the middle of a sentence or paragraph requires setting "pointers," designating the amount of space needed for the inserted text to prevent over-writing of existing text. If a new line does not use all the space you set aside, you must tediously delete all the trailing blank spaces. There is no facility for simply reformatting the paragraph.

You could use the block-move function to overcome this problem, but that would entail losing sight of the surrounding text receiving the insertion while you write the new text. In fact, the program's block-move function is really a block-copy

routine that requires you to delete to the original block of text. At best, this is an electronic typing program with minimal advantage over a typewriter.

Spreadsheet and Graphics

Similarly, the internal spreadsheet program is woefully inadequate. This is one of the smallest spreadsheets I have ever seen. The worksheet is made up of 50 rows by 17 columns (850 cells). By way of comparison, Easycalc 64 for the Commodore 64 has 254 rows and 63 columns (16,002 cells). With a spreadsheet this small, it would be difficult to develop an annual budget.

This inadequacy is puzzling

Ken Wildman is a professor at Ohio Northern University and an educational computing consultant.

because the program has some potentially useful features: for example, data can be transported to the word processor for incorporation into short reports. The Plus 4 even offers a limited windowing capability that displays a half screen of text and a half screen of the spreadsheet simultaneously.

The transportability of data to the word processor also provides for documentation of the spreadsheet. That is, cell labels and formulas can be printed without any of the data, yielding a document that shows the mathematics of the particular spreadsheet. Another positive feature is that cell labels can be used in formulas. These features make both construction and subsequent modification of an elaborate spreadsheet much easier.

The spreadsheet application is further supported by the Plus 4's integrated graphics program, which generates bar graphs from the spreadsheet data. However, graphs can be constructed only horizontally. The resulting graph is displayed as part of a word-processing document, and the bar graph is made up of Xs. Labels and numerical values must be added using the word processor—a very cumbersome procedure.

File Manager

The file manager is the best-developed program in the Plus 4. To use it, however, you need a disk drive.

The file manager stores 999 records on a uniquely formatted disk. Each record contains up to 17 fields that hold up to 38 characters each.

The file manager is well integrated with the word processor and the linkage between these programs allows for mailing list merging, mailing labels, and printouts of a particular sort from a database search. Commands in the word processor control the printing of selected fields from sorted records.

A Closer Look

The existing Commodore printers, serial disk drives, and monitors all work with the Plus 4's expansion ports. In addition, a parallel port allows use of a new disk drive, the 1551, which Commodore claims is faster than its serial disk drive.

However, the Plus 4 lacks compatibility with the immense software base available for the Commodore 64. Also missing are the sound synthesizer chip and "sprite" graphics that made the 64 such a versatile and popular computer. And the ports for a cassette tape recorder and joysticks are different, so if you're planning on upgrading from a VIC-20 or 64, figure some additional expense for those items.

Physically, the Plus 4 is an attractively packaged unit. It is small—only 13½ by 8 inches, and lightweight (3 pounds 10 ounces). The keyboard consists of 59 keys in standard typewriter format, four arrow-

shaped cursor control keys to the right, and four programmable function keys above. The programmable keys provide eight different functions (shifted and unshifted).

In BASIC the programmable keys provide one-key access to frequently used commands such as Disk Load, Disk Directory, Screen Clear, Disk Save, Run, List, and Help. The Help key is particularly useful. If you make a syntax error in a BASIC program, pressing the Help key will display the line with the error in flashing print. Users can redefine all function keys.

While the keyboard layout and typing angle are excellent, I found the keyboard itself to have a very loose feel. The keys rattled and bounced, and I had trouble typing—repeating letters and unintentional keystrokes became commonplace.

However, a dramatic improvement over the Commodore 64 is evident as soon as the Plus 4 is turned on, when the first screen message says 60671 BYTES FREE. The Plus 4 has almost 22,000 more bytes of RAM available for BASIC programming than the Commodore 64.

The new BASIC, version 3.5, may be the Plus 4's strongest feature. Over 70 BASIC commands and statements are incorporated in the Plus 4, including commands for most disk operations (Backup, File Copy, Load, Save, Directory, Header or Format, Rename, Scratch, and Verify), as well as automatic line numbering, program renumbering, Help, Do/ Loop/While/Until/Exit, Define Function, error trapping, and program line tracing. All in all, this new BASIC represents a significant improvement over the BASIC resident in the Commodore 64.

In addition, BASIC 3.5 supports a number of graphics commands that make more of the capabilities of the Plus 4 available to intermediate and advanced programmers. These commands include Circle, Box, Draw (for lines, dots, and shapes), Locate, Paint, Scale, and commands to store rectangular sections of screens (as string variables) and later retrieve and display them at any screen loca-

AT A GLANCE: Commodore Plus 4

Manufacturer:	Commodore Business Machines, Computer Systems Division, 1200 Wilson Dr., West Chester, PA 19380; (215) 431-9100
Uses:	Home and personal-productivity computing
Standard Features:	7501 8-bit microprocessor; 64K bytes of RAM; 59-key keyboard with four function keys and four arrow-shaped cursor keys; 25 lines by 40 characters in text mode and 320 by 200 pixels in graphics mode; two-channel sound generator; four in-ROM applications programs featuring word processing, spreadsheet, graphics, and file-management functions; rf port; serial-bus port; cassette port; RS-232 port; memory expansion (cartridge) port; two game ports; audio-video (composite) port
Documentation:	222-page <i>Commodore Plus 4 User's Manual</i> , 231-page <i>Commodore Plus 4 Integrated Software Manual</i>
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tion. Moreover, these commands allow the programmer to produce figures of various shapes anywhere on the screen using simple BASIC commands.

The only sound characteristics under programmer control are selection of voice (1 or 2), frequency, duration, and volume. Missing are all of the difficult-to-program but versatile controls of the sound chip provided in the Commodore 64.

In addition to the new BASIC, a machine-language monitor utility called Tedmon offers 16 commands for displaying the data in the microprocessor's registers, locating and manipulating specific bytes in memory, and assembling or disassembling machine code. Machine-language programmers will find this a very useful utility.

Who Will Buy the Plus 4

According to Commodore, the Plus 4 gives you software that is power-

ful enough to familiarize you with computer applications and flexible enough to be useful. Commodore also claims that the Plus 4 is not being marketed as a replacement for the Commodore 64. Early advertisements even suggest the idea of a two-computer family, with a Commodore 64 for the kids and a "serious" Plus 4 for the parents.

True, the Plus 4 is an excellent computer with a powerful version of BASIC and easy access to machine-language programming. The problem for Commodore, however, is that the Plus 4's built-in productivity software is deficient. Apparently Commodore is aware of the software's inadequacy because among the first software packages available for the Plus 4 are Scriptplus and Calcplus—a high-powered word processor and a spreadsheet that sell for about \$70 each.

On the other hand, the amazing popularity of the Commodore 64 has

led to the development of very good productivity software, far exceeding the capabilities of the Plus 4's internal package—a number of excellent word-processing programs as well as excellent spreadsheets, databases, and sophisticated graphics packages. For only a modestly larger investment you could buy a Commodore 64 (which sells for about \$100 less than the Plus 4) and benefit from the 64's software base with the added advantage of being able to buy precisely the software you need.

Because of this the Commodore 64 is a better buy. If the Plus 4's built-in software matched its programming capabilities and if it were compatible with the existing Commodore 64 software base, then the Plus 4 would represent a real advance by Commodore and an improvement over the current market leader. As it stands, the Plus 4 is just a contender, but it could have been the champ. □

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NEW PRODUCTS

Osborne's Back

Embattled computer company unveils its Vixen transportable computer



Osborne Computer Corp. bounces back with the Osborne 4 Vixen, a Z80A-based transportable computer weighing 22 pounds.

Priced at \$1298, Vixen features 64K bytes of RAM, a pair of double-sided, double-density 5¼-inch floppy-disk drives, and serial and parallel

interfaces. It also includes a 60-key attached keyboard. Hardware is built in to support bisynchronous communications.

The computer fits under all types of airline seats or in an overhead rack. The case is weather resistant.

Vixen's 7-inch amber moni-

tor offers 8- by 11-dot characters, reverse video, 95 alphanumeric characters, 32 graphics characters, and an alternate character set. The screen displays 24 rows by 80 columns. The computer's disk drives have a formatted capacity of 390K bytes and support a variety of Osborne, IBM, Xerox, Kaypro, and DEC disk formats.

Bundled with Vixen is an extensive array of applications software including Wordstar, Mailmerge, Supercalc 2, Media Master to exchange data disks with other computers, an electronic drawing board, a turnkey system, and an adventure game. Vixen is also shipped with MBASIC, CP/M 2.2, and a one-year membership in the Osborne user's group.

For further details, contact Osborne Computer Corp., 42680 Christy St., Fremont, CA 94538. **Inquiry 200**

Cutting Sord

A full-screen portable computer for under \$1500

Sord's IS-11C is a briefcase-sized computer that offers a 25-line by 80-charac-

ter liquid crystal display, a Z80A microprocessor, and 80K bytes of RAM (expand-



able to 144K bytes). The unit weighs under 7 pounds and is priced at \$1495.

The unit also features a built-in data recorder, bit-mapped graphics, and an AC adapter/charger. It has RS-232C, parallel, bar-code reader, numeric keypad, and telephone interfaces.

The IS-11C offers an extensive array of built-in software, including word processing, communications, and pre-programmed management utilities.

The system also accepts plug-in ROM cartridge programs. Optional hardware items include a mouse, a 3½-inch microfloppy drive, and a thermal printer.

For further information, contact Sord Computer of America, 645 Fifth Ave., New York, NY 10022.

Inquiry 201

Feed Me

The Paperpro RS-33 cut-sheet feeder

Rutishauser, a leading manufacturer of forms-handling peripherals, has introduced the Paperpro RS-33, a single-bin, clip-on, cut-sheet feeder.

Priced at \$395, it features an automatic feed mechanism and the ability to detect paper outages and jams. It works with paper sizes up to 8¼ by 11¼ inches and holds up to 80 sheets. Paperpro models are available for Okidata 83/84/93, Juki 6100, Silver Reed 500, Canon AP500/550, and Diablo C-150 printers.

For details contact Rutishauser of America, 10345 Brockwood Rd., Dallas, TX 75238. **Inquiry 202**

Printing in Color

The Model 750 color dot-matrix printer

JDL's Model 750 four-color dot-matrix printer offers three type fonts, an 8K-byte buffer (expandable to 72K bytes), and a Centronics-type parallel interface.

Other features include downloadable fonts, a maximum graphics resolution of 180 by 180 pixels per square inch, a 24-wire print head, Diablo 630 protocol compatibility, and Fujitsu DPL24 graphics compatibility. Easy-to-install ribbon cartridges come in black, cyan/magenta/yellow/black, and red/blue/green/black.

The Model 750 provides letter-quality printing at 100 characters per second, data-processing at 200 characters per second, and high-resolution graphics at 10 inches per second. Optional items include an RS-232C interface, tractor and single-sheet feed mechanisms, and additional international and technical fonts. The 35-pound printer is priced at \$1990.

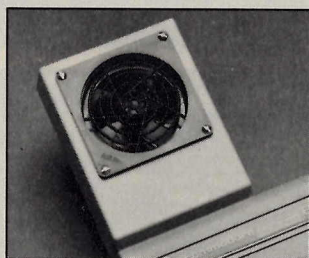
For information, write JDL Inc., 2801 Townsgate Rd., Suite 104, Westlake Village, CA 91361. **Inquiry 203**

Keeping Cool

Miracool fans keep your Commodore cool

Miracool-64 and Miracool-20 are single-piece, plug-in fan assemblies for the Commodore 64 and VIC-20.

Priced at \$52 each, the units force cool air over your computer's memory, micro-processor, and voltage-regulator chips, effectively lowering operating temperatures to below 100 degrees Fahrenheit. The fans, which have a rated life of 10,000 hours,



draw power directly from the computer, eliminating the need for a separate power supply.

For more information, contact CR Technologies, 4103 148th SW, Lynnwood, WA 98036. **Inquiry 204**

Graphic Excitement

The Model 700 Word Image Processing System

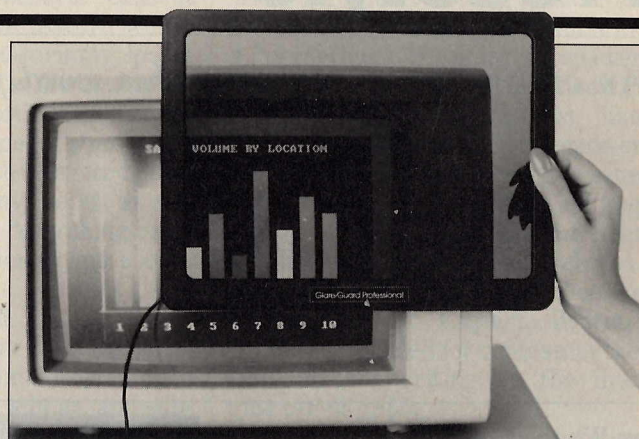
The Model 700 Word Image Processing System lets you create high-resolution graphics as easily as a photocopy.

To create an image, you place the document on the scanner's glass plate, close the unit's cover, and wait 30 seconds while the system reads the image. Once the docu-

ment has been scanned, the Model 700's software allows you to adjust the image's size, content, and position. The \$3950 unit is compatible with the IBM PC, XT, and AT.

Complete details are available from Datacopy Corp., 1215 Terra Bella Ave., Mountain View, CA 94043.

Inquiry 205



Reflection Reducers

OCLI introduces a pair of antiglare panels for video display terminals

Is video display glare playing havoc with your eyesight? OCLI has a pair of highly effective antiglare panels that promise to minimize screen reflections and enhance image-to-background contrast.

The Vantage panel (\$59) utilizes a high-efficiency anti-reflection coating that reduces glare by more than 90 percent. The Professional

panel (\$99) reduces glare by more than 94 percent, and it features a static-control system to minimize dust buildup and prevent static shock. Both units are equally effective on color and monochrome displays.

Complete details are available from Optical Coating Laboratory Inc., 2789 Northpoint Pkwy., Santa Rosa, CA 95401. **Inquiry 206**

Budget Modem

Smartlink II—a low-cost 1200/300-baud modem

Smartlink II is a 1200/300-baud smart modem designed for RS-232C-equipped computers.

The \$199 unit offers auto-dial/auto-answer capabilities, full- and half-duplex operation, and serial, binary, and asynchronous data formats. Smartlink II is bundled with a telecommunications program that's compatible with most popular computer models plus a one-year subscription to the Business Computer Network, an on-line information service. A 24-inch computer-to-modem cable is



priced at \$9.95 (\$11.95 for the Apple Macintosh).

For more information, contact Business Computer Network, 716 College View Dr., Riverton, WY 82501.

Inquiry 207

Freestyle

An outline generator takes this word processor beyond the basics

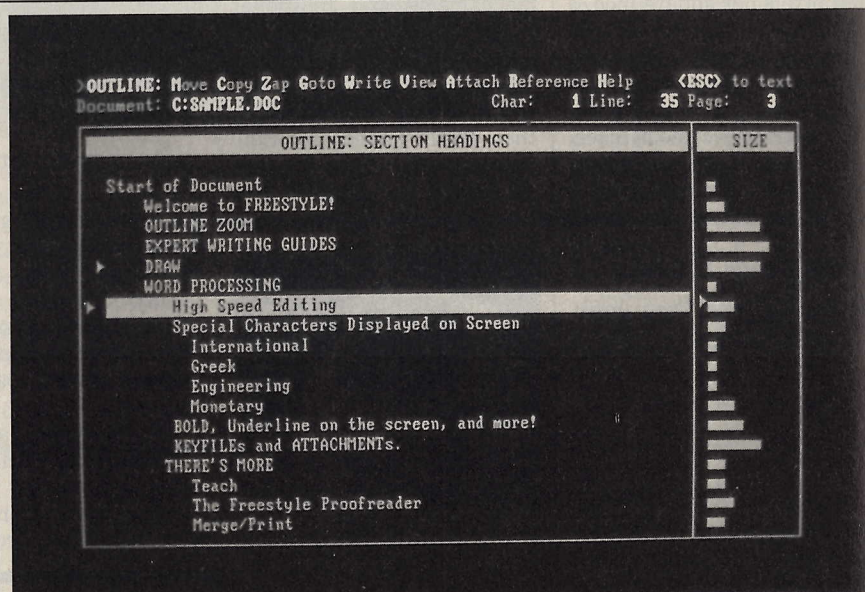
by Whitney Bolton

Freestyle is a member of a budding new class of hybrid word-processing programs. Described by its manufacturer as an outline-based writing system, this program is likely to cause quite a splash.

Freestyle has most of the standard word-processing features along with several others, such as sub- and superscript and foreign characters, that are usually considered frills. Beyond its word processor, Freestyle contains an outline creator (which greatly facilitates moving text around in your document), a mailing list generator, a spelling checker, and a Draw function that lets you compose elementary pictures within a text document. These extras make Freestyle a potent package for advanced users, while the manual, on-line tutorial, and Help features make it a friend at first sight even for the inexperienced.

Not all the appealing specifications, however, translate into powerful or even friendly action. Some are fancy and fast, like insertion and deletion, some plain and plodding, like block moves and revision. But Freestyle remains bulletproof at all speeds: no user blunder is fatal, for like the magnanimous pachyderm the program always forgives though it never forgets.

The package bristles with teaching and Help features. In an



hour or so, the Teach tutorial will step you through the commands one by one with interactive demonstrations and then congratulate you on your success or console you for failure, with constructive tips on what went wrong. Error trapping in all Freestyle commands is notably thorough and amiable.

The manual is equally clear and purposeful. Directions for a typical command first explain its function, then continue with numbered instructions that include screen facsimiles, and conclude with useful notes. Additional aids are a getting-started brochure that adapts the generic manual to your system; more than 80K bytes of on-line Help, available for each command with a

couple of keystrokes; an introductory file that will produce over six single-spaced pages of printout describing the program's features; and a small sticker to remind you—in English and Spanish—of the special uses Freestyle makes of the numeric minus and plus keys. The package, however, lacks a quick reference card.

Also not in the package, but planned, are two potentially powerful pluses: the 4-1-1 Hard Disk Management and Security System, which makes document retrieval easy for the forgetful and impossible for the unauthorized (at the time of this writing, the security system

Whitney Bolton, a professor at Rutgers University, is an author of books and articles about English.

was scheduled to be released by the time you read this and expected to retail for \$149); and an advanced Freestyle Index, which generates an index for the document you've created (expected release date and price not presently set). Access to both optional extras is already built into the Freestyle menus.

The Basics

You begin work in Edit mode, where you can only move the cursor or go to another menu; Insert mode is where you'll do all your writing. In Edit mode, many nonalpha characters control cursor movement by whisking you to the next appearance of the character—a period gets you to the end of the sentence, for example—but in Insert mode you can move the cursor only with the four arrow keys and Home or End.

This difference in cursor movement between the two modes can cause some confusion: with the IBM version of Freestyle to move the cursor a word to the right in Edit, for example, you hit the spacebar; for the same move in Insert, hit End. "Intuitive" is a slippery term; one user's intuitive might be another's inscrutable. But Freestyle did not strike me as intuitive, though it is versatile and very speedy.

To get some of its speed, the program puts the paragraph you're writing or editing into a separate buffer; that way the real-time justification doesn't have to shuffle the whole document for every jot and tittle, so your screen arranges most input in an eye twinkle.

Other actions can be more laborious and slower: you move a block of text by pressing the Esc key to move from Insert mode to Edit, marking the transient block fore and aft with numbered pointers (two strokes each, plus moving the cursor between them), moving the cursor to the intended destination, and hitting M and the pointer numbers. After all your typing, the program takes time with its chores too: if the block is fairly long and near the end of the document—as, for example, an afterthought often is—the pause

after you hit M can range from frustrating to frightening.

The search (Freestyle calls it Locate) and replace feature works faster and more reassuringly; locate will even unearth a particular instance of your word, such as the fourth time you typed "typo." Both commands operate forward and backward from any point in the document and flash "searching backward" if that direction is your choice.

Outline Command

A Freestyle outline is like an automatic table of contents: as you write the headings, subheadings, and subsequent subheadings in your text, the program surreptitiously compiles them into a neat table. Unlike a mere table of contents, however, a Freestyle outline includes a bar chart that shows you the relative length of each section. What's more important, it gives you master control over the text: to move a section you need only move its caption in the outline; so also to go to it, copy it, view it, or zap it.

You can build the outline as you go along, or you can tailor your text to

an outline you've already created with Freestyle, or you can use a writing guide. A writing guide is an outline that prompts you to fill it in, a hierarchical checklist to answer your desperate "What'll I put next?"

Freestyle writing guides, like chocolate cakes, can be homemade or store bought: you can whip one up for the people in your office, adding to your outline comments and help for filling it in; but Select Information Systems plans to produce its own series of Expert Writing Guides, scheduled for release, at the time of this writing, in the first quarter of 1985.

The current package includes Writing a Business Agreement without a Lawyer, which you can dump to your printer (though on my copy the writing guide abruptly began underlining everything on page 5 and never stopped thereafter). The Expert Writing Guide in the package has an on-line outline for you to fill in, and an on-line reference file—something like a Help file—with more explanations and examples.

Advanced Features

Likewise a step beyond word processing is the Draw function which gives you the option to compose, at least on the screen, a picture made of lines, arrows, and shaded areas. You'll stay in text mode, so it won't be a pixel picture, and not all printers, even the dot-matrix, will copy every detail. For many sorts of tables, however, such as organizational charts and flowcharts, Draw hits the bull's-eye.

The package also includes a mailing list feature that will merge your mailing list, which can also dwell in a Freestyle file, with a form letter. The commands do not enable you to select a customized list for a particular mailing—numerically by zip code, for example, or by range between values such as A and G or less than 1000—or to purge it of unwanted items, like deadbeats.

For discovering file length in bytes you'll have to use DOS: Freestyle won't give you a file length in any of the several ways it gives you a view

At a Glance

Name: Freestyle Version 1.0

Type

Word processor with built-in outlining module

Manufacturer

Select Information Systems
919 Sir Francis Drake Blvd.
Kentfield, CA 94904
(415) 459-4003

Price

\$295

Format

Three 5¼-inch floppy disks

Computers

DEC Rainbow, IBM PC, XT, AT and select compatibles; requires DOS 2.0 or higher, 192K bytes of user memory, and two double-sided disk drives

Documentation

233-page training and reference manual and 28-page installation booklet

Audience

Anyone who wants a versatile word-processing program; designed especially for creators of text rather than typists

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of what's on your disks. And for a word count you'll have to switch to the proofreader, which as a by-product divulges the number of words it has checked, the number of words not counting repetitions, and how many it couldn't match with its dictionary.

As delivered, the dictionary weighs in with fewer than 10,000 words. It's easily stumped by words with common endings like "s" and "ing," and in checking this review it couldn't account for "default," "desktop," "DOS," "filename," "floppies," or "format," among others. But it agrees readily to expansion; it'll add an unmatched word to its OK list on your keystroke go-ahead.

The Compose feature is another frill that's standard equipment with Freestyle. Just massage the keypad plus key and two other letters, such as M and u for the Greek letter "mu," and your screen will blossom with the desired character. If your dot-matrix printer has the character in text ROM, you'll get it on the printout too. Numbers of academics who require such embellishments are already taking notice.

Freestyle offers no windows or automatic footnotes, but it supports boldface and underlining, which it shows as such on your display, along with superscript, subscript, and special fonts like italics, which it lumps together in reverse video.

It gives you control over ordinary formatting parameters such as lines per page, less ordinary ones like characters per inch, and really quirky ones like lines per inch. With the latter you can combine, say, double-spacing with eight lines per inch to get space-and-a-half between lines. It also supports background printing so your computer doesn't have to play Alphonse and Gaston with your printer.

The Floppy Shuffle

The package arrives on no fewer than three disks, and you can't put system files on any of them, so each time you use Freestyle you have to begin by booting DOS. You'll want a data disk in some drive or other,

of course, and the manual advises you to have another blank formatted disk handy. You're already looking at six floppies on the desktop like so many fish on the deck.

The reason is clear: the Freestyle Master program disk has over 330K bytes of data in its 15 files, so the DOS system files won't fit. The solution is clear too: format a double-sided blank and copy COM-MAND.COM to it. Then add all the files from your backup master except the SAMPLE.DOC and SAMPLE.REF files to free 24K and, if you're bold, the two HELP files for another big 80+K. Now you'll have room for your DOS system files and more. You can put that extra space to good use storing keystroke-saving macros.

Macros

The program includes a KEY facility that stores and retrieves macros, tagging each with a number. By pressing "1," for example, you can splash the screen with your form memo on lateness, needing to add only the date before you print it out for your awed underlings.

You can have as many key macros as space on your disk allows, and you can call the tag numbers up to 10 with the IBM function keys while still in Insert mode, thus saving you the bother of entering Key mode (in fact, calling the key tag numbers is the only use for the function keys in Freestyle).

While Freestyle's macros are handy, Rossoft's Prokey is a more versatile approach to macros. You can put it in the extra space you've cleared on the master disk, where you can also use it to minimize many of Freestyle's multi-key commands.

For example, the manual counsels you to "Quit and Keep frequently if you are making a lot of changes in your document. This will write your changes on the disk and ensure that you won't accidentally lose them."

But saving entails almost a dozen moves. You (1) Esc to get out of Insert, (2) Q for the Quit menu, (3) K for Keep (and wait for the disk to absorb what's in RAM), (4) R for

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POPULAR REVIEWS: SOFTWARE

of what's on your disks. And for a word count you'll have to switch to the proofreader, which as a by-product divulges the number of words it has checked, the number of words not counting repetitions, and how many it couldn't match with its dictionary.

As delivered, the dictionary weighs in with fewer than 10,000 words. It's easily stumped by words with common endings like "s" and "ing," and in checking this review it couldn't account for "default," "desktop," "DOS," "filename," "floppies," or "format," among others. But it agrees readily to expansion; it'll add an unmatched word to its OK list on your keystroke go-ahead.

The Compose feature is another frill that's standard equipment with Freestyle. Just massage the keypad plus key and two other letters, such as M and u for the Greek letter "mu," and your screen will blossom with the desired character. If your dot-matrix printer has the character in text ROM, you'll get it on the printout too. Numbers of academics who require such embellishments are already taking notice.

Freestyle offers no windows or automatic footnotes, but it supports boldface and underlining, which it shows as such on your display, along with superscript, subscript, and special fonts like italics, which it lumps together in reverse video.

It gives you control over ordinary formatting parameters such as lines per page, less ordinary ones like characters per inch, and really quirky ones like lines per inch. With the latter you can combine, say, double-spacing with eight lines per inch to get space-and-a-half between lines. It also supports background printing so your computer doesn't have to play Alphonse and Gaston with your printer.

The Floppy Shuffle

The package arrives on no fewer than three disks, and you can't put system files on any of them, so each time you use Freestyle you have to begin by booting DOS. You'll want a data disk in some drive or other,

of course, and the manual advises you to have another blank formatted disk handy. You're already looking at six floppies on the desktop like so many fish on the deck.

The reason is clear: the Freestyle Master program disk has over 330K bytes of data in its 15 files, so the DOS system files won't fit. The solution is clear too: format a double-sided blank and copy COM-MAND.COM to it. Then add all the files from your backup master except the SAMPLE.DOC and SAMPLE.REF files to free 24K and, if you're bold, the two HELP files for another big 80+K. Now you'll have room for your DOS system files and more. You can put that extra space to good use storing keystroke-saving macros.

Macros

The program includes a KEY facility that stores and retrieves macros, tagging each with a number. By pressing "1," for example, you can splash the screen with your form memo on lateness, needing to add only the date before you print it out for your awed underlings.

You can have as many key macros as space on your disk allows, and you can call the tag numbers up to 10 with the IBM function keys while still in Insert mode, thus saving you the bother of entering Key mode (in fact, calling the key tag numbers is the only use for the function keys in Freestyle).

While Freestyle's macros are handy, Rossoft's Prokey is a more versatile approach to macros. You can put it in the extra space you've cleared on the master disk, where you can also use it to minimize many of Freestyle's multi-key commands.

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graphics can store nearly 10 times as many pages on a single floppy disk as programs that rely on static screen representations. What's more, a single Hypergraphics "page" can actually include a number of dif-

sponse. These two features permit the complex branching often needed for tutorials.

Unlike many other graphics packages, Hypergraphics lets you create a help facility to use with other pro-

You can learn a great deal about Hypergraphics just by working your way through its delightful tutorial.

ferent screens and a variety of animated sequences.

Hypergraphics does provide a way for you to incorporate static screens or partial clippings from such screens into your presentation. You can use the predesigned screens available in Hypergraphics' six picture libraries (available as options at \$60 each) or copy designs from any other picture library source. You can also create your own designs using a drawing pad.

Static screens must be used sparingly in long presentations, however, because they eat up a lot of disk space. Only about 20 full-screen images can be stored pixel by pixel on a disk. You can get around this limitation by repeating images throughout a presentation. By varying the color palette, clipping different parts of the same image, superimposing animation and text, and using Hypergraphics' picture windowing techniques, you can reuse static screens very effectively.

Hypergraphics' branching tree structure makes it especially easy to create computer-aided-instruction (CAI) materials, which are based on the concept of frames. Creative CAI authors use different frames for different types of formats, such as true/false and multiple choice. Hypergraphics allows branching between frames, based on your response to questions or selection of a menu item.

Each Hypergraphics page is automatically linked not only to the next page but also to seven off-page references. Hypergraphics has a built-in command that lets you instruct the program to wait for a response then take action based on that re-

grams you've written. You can associate an external, executable program with a function key so you can switch back and forth between a Hypergraphics tutorial and the program it's describing.

Hypergraphics comes with a system disk, a backup, and a delightful tutorial that takes you through a presentation generated by the program. Thus you can learn a great deal about Hypergraphics just by paging through the tutorial, which demonstrates virtually every feature, including extensive animation and interactive question-and-answer sessions that you'd use in instructional materials. For practical hands-on experience, the tutorial lets you modify a few of its pages. Once you complete the tutorial, which takes about three hours, you'll be ready to get to work.

To create a Hypergraphics file, you name it, reserve the number of pages you think you'll need (you can change this later), then call up the graphics editor. Two palettes of three complementary hues and a choice of 16 background colors are available to work with.

The Graphics Editor

In edit mode, you can design or modify pages, preview how they will look when they are recreated, and link them in a logical sequence. This powerful editing capability distinguishes Hypergraphics from more traditional graphics programs.

In Hypergraphics terminology, you create objects and store them in an ordered list called an object string that becomes associated with each page. You can assign a delay or hesitation attribute to an object to

postpone its appearance. When you go into presentation mode, the objects that make up the string appear in sequence to recreate a Hypergraphics page.

To take a concrete example, one of the pages in the demo draws a picture of the IBM PC's system unit and describes its major parts. This sequence, created with the graphics editor, includes 43 objects in its string, provides about 10 seconds of animation, and causes five screen changes triggered by pressing the space bar.

"The Heart of my Personal Computer," proclaims the text, "is the system unit." The first time you press the space bar, a heart "thumps" up and down on the screen three times. The next time you press it, you see the words "Here are some of its external parts." Hit the space bar again and the text "On/Off Switch" appears at the bottom of the screen and moves up and over next to the system unit's on/off switch, linked by a connecting arrow. Press the space bar two more times, and the other external parts of the system unit are identified in the same animated sequence. This may sound like a complicated example, but it actually uses less than a third of the capacity of a single Hypergraphics page.

In edit mode, you can preview execution of an object string to see how the objects would look in presentation mode, and then you can edit the list freely. Objects can include, in varying sizes, a box, a circle, a line, an arc, a freeform drawing, text, an object that paints or clears the screen, a pixel-based screen image, and a clipping from a screen image.

Many actions can be performed on an object: you can paint it (which fills the object with color), change the object's border color, change to another palette, move it by animating at a selected speed from one through nine, duplicate it, save and load screen images, clip and paste partial screen images, create a response request and wait for the answer, and assign a hesitate or delay attribute, which causes the presentation to

wait a few seconds or until the space bar is pressed before displaying the object.

No programming in the traditional sense is involved. To create an object, you use the keypad to position a crosshair where you want the object to appear then press the appropriate function key for that object: F1 for box, F2 for draw, and so on. Using left and right arrow keys, you preview available border colors for the object and press Escape to select one. To use animation, you mark an object, such as a box or text string, at opposite corners using F6, move that object where you want it using keypad keys, then press F6 again to terminate the move. To add text to a screen, you just type the characters exactly where you want them to appear.

As you are designing the page with the function keys and numeric keypad, the program is keeping

track in an object string list of which object goes in what order. After you've put together a screen, you can refine it by inserting or deleting objects from the string or assigning them delay attributes. You can also copy an object string from one page to another. For example, you can copy a menu's object string to another page, using it as a template for new text.

Using the Text Editor

While you can create text using either the text or graphics editor, the text editor has some built-in word-processing commands that simplify text manipulation. The Insert, Delete, Home and cursor keys behave as you would expect. You can kill or add a line, delete everything from the cursor on, and shift text columns to the left or right. In either editor you may use the 40- or 80-column mode; however, color is permitted only in the 40-column mode.

The text editor is very handy for preparing presentations quickly or when you need to include large blocks of text. The text editor, however, has limited graphics capability. But it does support delayed materialization.

It's up to you to remember which editor you used to create a given page. While learning Hypergraphics, I wasted at least an hour trying to modify a screen before realizing that I couldn't edit it with the graphics editor because I had created it with the text editor. However, as I later discovered, you can use the Hypergraphics Analyze utility to produce a report showing how the pages of your presentation are linked and which editor created each page.

Presentation Mode

Presentation mode is where you actually deliver or view the presentation you created with one or both of the editors. In presentation mode, you can select topics from menus you created and use navigation commands, numeric keys, and the space bar to advance through the screens in the proper sequence. If the pre-



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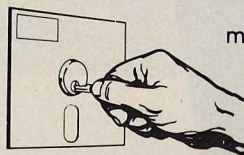
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At a Glance

Name: Hypergraphics Authoring System, Version 2.01

Type
General-purpose graphics package

Manufacturer
Hypergraphics Corp.
POB 50779
Denton, TX 76206-0779
(817) 565-0004

Price
\$395

Format
Three 5¼-inch floppy disks

Computers
IBM PC, PCjr, XT, AT, and compatibles; requires 128K bytes of user memory, DOS 2.0, and a color graphics card; two disk drives recommended

Documentation
88-page manual and interactive on-disk tutorial

Audience
Communicators and authors of computer-based tutorials, on-line help facilities, how-to books, and marketing and sales presentations

Options
Six picture libraries—fonts, U.S. and world maps, faces, personal computer components, and borders—each with about 30 objects, \$60 each; "How to Author CAI" guide, \$19.95; and demo disk, \$10



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February 20, 1984

Letters,
Popular Computing
P.O. Box 397
Hancock, NH 03449

Dear Editor:

I jotted off this little poem on behalf of all those arid Apple owners who spend most of their time in front of the screen. I hope they enjoy it.

Ode to the Apple

Always keep your cursor blinkin'
and your syntax without a flaw.
Save your programs at end of typin'
and observe the copyright law.
Treat your computer with TLC
It will be your pride and joy.
Watch your bauds and bits and bytes
and when programming good rules employ.
For if you heed all that's said
and all the statements made too,
You'll control your Apple easily
So it won't take a byte out of you!

J. Ludrick '83

I really enjoy Popular Computing, especially the "Program Factory" by George Stewart.

Sincerely,

John A. Ludrick
Dr. John A. Ludrick
Asst. to the Dean
School of Education

JAL/ko

Box 1674
Chicago, IL 60698
May 12, 1984

Letters
Popular Computing
Box 397
Hancock, NH 03449

Dear Editor:

Your review of data base software by Michael J. M. F. Goley IV was good. However, your note about it indicates that an IBM PC is required. Jim Button distributes a version for the Osborne 1. While it indicated in the article was \$45, PC-FILE is "user public domain software" -- Button requests a contribution like the program and use it, but it is available from sources. I can provide Popular Computing readers Kaypros, Morrows, and several other types of CP/M copy for \$5 and they can decide whether they want Button's requested contribution. (As a very satisfied customer in my contribution -- I got my Osborne before it offered.) PC-FILE supports up to 1500 records (no need to sort), 37 fields, 99 characters per word, more than 18 fields are used in which case the max characters per field, and sorts on up to 10 fields. Readers who request a copy of PC-FILE should specify

Jerry Pournelle's article on operating systems was might be interested that Mike Rubenstein has made Osborne users to patch their operating systems to writing a program called OZCPROGEN.COM that does it. I have never read the ZCPR docu. It thoroughly simple ZCPR features make it go. I have said else about it: (1) it searches for files, (2) it lists the files, (3) it searches for CP/M wild cards I can be sure function throws up one screen of the text from flying past on the Osborne 1. Users who order a copy of OZCPROGEN.COM and a ZCPR (the full documentation library, I understand!)

Very truly yours,

Benjamin H. Cohen
Benjamin H. Cohen

In the "ASK POPULAR" column of the June 1984 issue of Popular Computing, James Keller inquired about how to use the features of his Epson printer from Apple Writer. You overlooked telling him that provision has been made for the user to send the printer special control sequences by preceding and following the special characters with Control-U's. Unfortunately, it is sometimes difficult to figure out what to send! There is also a hardware device available for about \$70 called the Fingerprint that permits setting Epson printers into different character sizes and print modes by pressing one of the Epson's paper control buttons. This of course is not practical unless the whole document is to be printed with a single printer mode. One of the alternatives you suggested may be the proper direction to take, but I thought others should be noted.

Mike Kramer
Mike Kramer
2218 Running Springs
Kingwood, TX 77339
8 May 1984

MAY 14 1984



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Our readers actually help shape the magazine every month because they are computer owners and users, and because sharing information is what computers are all about.

They send us hundreds of article suggestions. Excellent ideas, and the real problem is choosing which ones not to use.

They user-test hardware and software in the real world of their offices and homes, and write many of our reviews. That's why Popular reviews have the tang and bite of reality rather than an ivory tower detachment or the bland excitement of a press release.

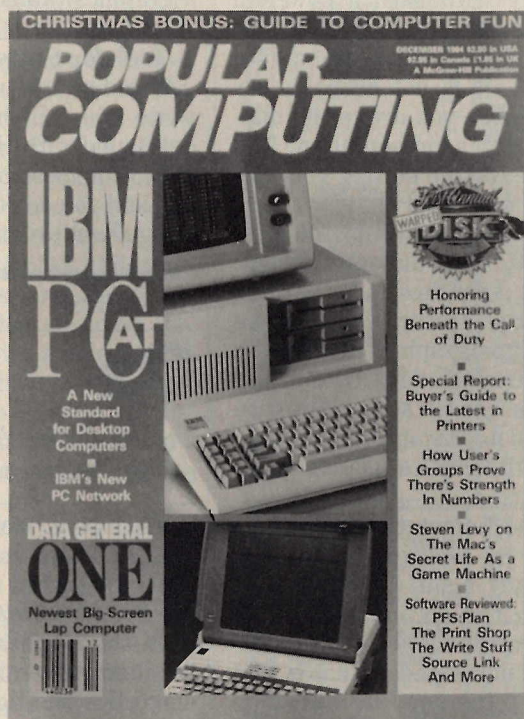
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sensation is interactive, you answer questions whenever they are put to you. For example, the tutorial presentation teaches you the meanings of certain keys then gives you a pop quiz that asks you to demonstrate your understanding by pressing the right key at the right time.

Some of the presentation commands are geared toward group presentations rather than self-teaching. You can use function keys to move a pointer up and down the screen and highlight lines as you explain them. You can turn on reverse video whenever you think it will improve a screen's readability. You can press Escape to skip the rest of a long page if you're running overtime. You can also set a presentation on automatic and walk away from it while it moves from page to page in a continuous loop—handy for a trade show demo.

Documentation and Utilities

Obviously with such a powerful program, documentation of all the features is crucial. While the tutorial is excellent, it is not available for reference when you are in the middle of editing a presentation. You either have to stop editing your file and load the tutorial or refer to the cryptic manual. And to say the manual is cryptic is an understatement: it adds only a few new pages to cover many of the features that were added to Hypergraphics when it was upgraded to run under DOS 2.0. The manual also lacks screen illustrations and is haphazardly organized, making it difficult to use for reference purposes.

These documentation problems may soon be alleviated, however. The company plans to release version 2.5 in the second quarter of 1985. This version will contain an on-line help "encyclopedia" that is said to eliminate the need for hardcopy documentation. According to the manufacturer, you'll be able to look up information by keyword or subject area while in the middle of building a presentation. Current registered owners of Hypergraphics version 2.01 will be notified by mail of

the upgrade in advance of its release and will be able to upgrade for a nominal fee.

The poor documentation forced me to explore on my own. One useful discovery I made is that, with a simple command, you can enter the graphics editor while viewing the tutorial to examine the various object strings that produced its pages. Once in the graphics editor, you have access to excellent examples. You can also use the Merge utility to merge a set of pages from the tutorial into the presentation you're working on to examine them in detail.

Merge is just one of several useful utilities. The HGFOTO utility allows you to run another graphics program, such as a Koala Pad program, and save screen images on disk. You can then incorporate all or portions of these images into your Hypergraphics presentation. This gets around the fact that Hypergraphics does not directly support the use of a graphics tablet.

A Tool for Software Authors

Would-be software authors can write and sell their own programs developed with Hypergraphics. The authoring possibilities are intriguing, and you don't have to know anything about programming to develop

such diverse applications as a children's book, a trivia game, a tutorial on astrology, or an on-line recipe book. All you need is an inventive idea, a flair for mixing graphics with text, and a storyboard.

Hypergraphics has a way for you to market such a program by coupling it with something called a Delivery Monitor, which allows buyers to run your disk without having to purchase the Authoring System. (Check with Hypergraphics for licensing details.)

Like most graphics tools, this program needs to be seen to be appreciated. For \$10 the company will send you a demonstration disk. And that's what hooked me, despite the poor documentation.

Hypergraphics is a graphics manipulation tool with great potential for authors and other communicators. While dynamic animation and screen re-creation are beginning to appear in other graphics programs, Hypergraphics' ability to be used with programs you have created and its sophisticated CAI features are still not available in any comparably priced package. But until the manufacturer polishes the documentation so you can easily see all facets, Hypergraphics will remain a diamond in the rough. □

BUSINESS

Oz

Fox & Geller's tracking and analysis tool puts managers on the yellow-brick road to financial control

by George F. Goley IV

Oz, the financial management package from Fox & Geller, doesn't hail from the legendary Emerald City, but it has several features that may make the package as attractive to managers as the ruby slippers were to Dorothy.

Oz helps managers control their businesses by providing both the tools and procedures needed to manage the organizations' finances. Oz can track and analyze the perfor-

mance of various operating units in a corporation, consolidate financial statements, present conclusions in graphic form, and generate reports.

The tasks that Oz performs can also be accomplished with general-purpose programs such as Lotus 1-2-3 and Framework. The difference is that with such software

George F. Goley IV is manager of management information systems at Prime Resources Group Ltd. in Philadelphia. He is also president of Micro Endeavors Inc., a New Jersey-based microcomputer consulting and programming firm.

you have to spend time defining the relationships between data items and designing the procedures involved in any transaction or consolidation. Oz comes with many of these relationships predefined and it automatically takes care of the steps necessary in processing transactions and consolidations.

Oz can be described as a back-end processor. That is, it's designed to produce usable management information from raw data gathered by conventional procedures or other programs. Oz is not a replacement for other types of management tools such as spreadsheets and database programs but rather a fairly narrowly defined supplement to more general-purpose software.

Oz allows you to transfer data, with some formatting restrictions, from Lotus 1-2-3 and Symphony, dBASE II, Visicalc, Supercalc, IBM BASIC, and Multiplan. It can read DIF (Data Interchange Format) files, comma-delimited sequential files, and SYLK files. The transfer procedures are amply explained in the manual.

The 292-page manual begins with a discussion of management control systems including sections on goal setting, monitoring and adjusting plans, and using Oz to execute these tasks. Three separate booklets contain a tour of the program, updates to the main manual, and tips for advanced users. Oz is menu-driven. The main menu has two parts: actions and data. You choose an action simply by typing its first letter or pointing to the option with the cursor and hitting the Return key. You then choose the data on which you want to perform the action. Pressing the Escape key allows you to back up to the previous menu. Correcting a mistake usually is just a matter of retyping the command. Finally, up to five levels of help screens are always available via the F1 key. These help screens contain basic information for all of the options in each menu.

Oz makes extensive use of the IBM PC's function keys and constantly displays the settings for

these keys as they change from menu to menu. Very little typing is involved in working with this program because most data entry is numeric, and most commands are selected as options from menus. Further, it is very easy to abort or discard changes and additions.

Setting Up Organizations

At the heart of Oz is the organizational chart, in which you establish the relationships between the subunits by categorizing and defining each unit as parent, child, sibling, or elemental. Oz references these relationships constantly as it performs its analyses and calculations.

Setting up the chart, which is the first step in using the program, is a straightforward, well-documented, and speedy procedure. You could, for example, describe a small organization of about 10 or 15 units in less than half an hour.

The corporation is the parent. Individual divisions within the corporation are the children. Oz can accommodate eight separate divisions. Each division is a sibling of the others. Each division has eight operating companies or children of its own. The operating companies also are siblings of each other. Several of the operating companies have one or more departments as children. These departments, and the operating companies that have no departments, are known as elemental units because they have no children, and they form the bottom of the hierarchy. Oz can handle a maximum of 50 units for the entire organization.

You can, of course, have asymmetrical hierarchies that include elemental divisions as well as divisions with operating companies. Oz is concerned only with parent, child, sibling, and elemental relationships; you can name the units anything you like.

You define the relationships among the units on-screen. Each screen has a box in which you identify the parent and eight boxes for specifying the children units. To create a unit, you position the cur-



OZ

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sor on one of the boxes and press the insert key. The program then prompts you for the name of the unit, an identifying code, its manager, its manager's extension, and its line file, which is a custom-defined "bottom line" for each unit. (The bottom line does not have to be revenues minus expenses; you can define it any way you like.)

To enter information for additional units on the same level, that is, siblings, you use the left or right arrow key to move from box to box on the same screen. To enter units on the next level down, that is, children of one of the units on the screen, you press the down arrow key. Likewise, to enter units on the next higher level in the hierarchy, you press the up arrow key.

Your Own Wizard

Oz tracks an organization's performance through figures, such as actual, budget, forecast, and historical, that you enter as line items. Line items can be either single units of data or the results of formulas that you specify.

Oz requires that you define each line item with a three-character tag, a 30-character description, a one-character code, and optionally, a formula for calculation. You enter this information on a screen that has, conveniently enough, a column for each type of information. The tag is simply a short identification for the line item and facilitates later reference. The codes identify items as revenues, expenses, productive and nonproductive assets, productive and nonproductive liabilities, equity, head count, cumulative and noncumulative real numbers, or cumulative and noncumulative integers.

The codes aid Oz in its evaluation process. For example, revenue is predefined so that revenue in excess of budget is shown as favorable. Expense is predefined so that expenses in excess of budget are shown as unfavorable. You can change these predefined definitions if you need to.

Nonbottom-line information such as job costing, standard cost inven-

tory, numerous financial ratios, and a great deal more can be tracked through the judicious use of line items. Oz can handle up to 149 line items per organization. Remembering that you can define the line items any way you like, let's explore a simple example.

Your company sells three products: A, B, and C. Your expenses are salaries, cost of goods sold, taxes, supplies, and rent. You're interested only in the bottom line—revenues minus expenses. To create a line item for product A, you assign it a tag, describe it in 30 words or fewer, and identify it as revenue by assigning it the one-letter code "R." You repeat this simple task for all revenue and expense items. In each case, you do not specify a calculation because each item is a value to be determined by actual, budget, or forecast data you enter later.

The line items tie together various units in the organization in ways that you specify. For example, you might design a line item called "total revenue" to subtotal all of the revenue from your various products. This line item will have a code of "R" and include a calculation that looks like this: A + B + C. You have told Oz

that total revenue is the combined total of the line items that have the tags A, B, and C. After creating a similar line item for total expenses, you must create a bottom-line line item. This line item has the tag "Net" to identify it as your bottom line and includes a calculation like "Rev - Exp."

Entering Data

Entering data is a simple enough procedure. You choose the type of data you want to enter, such as budget, actual, forecast, and historical, from the main menu and type in adjustment or replacement values for any or all line items for any or all months in the current, prior, or next fiscal year. In addition to entering the numbers for a line item and period, you will be prompted to enter a three-line explanation of the entry. This explanation is vitally important for analyzing positive and negative variances. For example, "costs of goods sold rose unexpectedly due to the sudden increase in silver prices" might explain higher than expected costs for a jeweler.

Typically, you'd enter budget information for all 12 months for all line items once a year, actual data once each month for each line item, and update forecast data frequently to accommodate changes in the business environment.

Actual data may be entered only for the elemental units, those units at the bottom of the hierarchy in your organization. Each child unit may contain all or selected line items from its parent's list of line items but never additional line items. Higher-level units will reflect the data entered for these elemental units after consolidations are performed.

Oz makes it easy to consolidate data into one financial statement. You need only select a unit to be consolidated, select the consolidate option from the main menu, and answer several error-checking questions.

The consolidation process works according to the relationships you've defined with the organizational chart. Consolidation could, for example, take all line items in an oper-

At a Glance

Name: Oz Management Control

Manufacturer

Fox & Geller
604 Market St.
Elmwood Park, NJ 07407
(201) 794-8883

Price

\$495

Format

Four 5¼-inch floppy disks (including a backup)

Computers

IBM PC, XT, AT, and 100 percent compatibles with 256K bytes of user memory, two disk drives or one floppy- and one hard-disk drive

Documentation

292-page manual with three supplementary booklets

Audience

Corporate managers, small business executives, line managers, controllers, and financial managers of all types

ating company and put them into corresponding line items in the divisions. Oz advises you of its progress with periodic reports.

Analyzing Your Data

You may analyze the data and create graphs and reports for any unit in your organization. This analysis can take the form of simple, variance, or comparison analysis. Simple analysis shows the data set (for example, actuals for this year). Variance analysis shows the difference between two data sets (for example, budget versus actuals). Comparison analysis shows two or more data sets side by side.

In all three forms of analysis, you have several options to assist you in analyzing results. You can look at your data by month, organization, or line item. You can explode a line item, such as expenses, to examine the other line items on which it is dependent to nail down the causes

of variances. You can also retrieve the explanations of various journal entries to further clarify trends.

Creating a graph is a matter of pointing to those elements in your analysis that are to be graphed, choosing a graph type, choosing from among several display and titling features, and pushing a button. Once the analysis is complete, creating a graph can take less than a minute.

And these are presentation-quality graphics. You can choose from bar, pie, line, area, percentage bar, stacked bar, horizontal bar, and multiple graph with up to three different graphs displayed simultaneously. The pie charts include up to three pies on the screen at once and up to two slices removed from the pies for extra emphasis. Color is available if your equipment supports it.

Reports are just as easy to generate. You simply follow menu prompts and identify the informa-

tion you want in the reports. Oz's reports are tabular printouts of columns of numbers.

Oz is copy-protected and you get one backup with the package. Replacement disks are available to registered owners. Oz requires three disks to run and those with floppy-disk drives may find the continual exchange of disks to be annoying. But to say that this detracts significantly from Oz's overall value is like saying that the supersonic transport is less valuable because it requires a long runway.

Oz is so easy to use that it actually lets you work on the problem, not on learning the software. The graphics and consolidation features are first rate and of great use to managers interested in the bottom line. If you're a manager trying to control the finances of any size organization, Oz might be just what you need to put yourself on the yellow-brick road to financial control. □

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BUSINESS

Open Access

The database, spreadsheet, and graphics modules form the heart of this six-program business package

by Victor Scheluchin

With Open Access you get almost everything but the kitchen sink. An integrated package from Software Products International, Open Access contains a relational database, spreadsheet, word processor, three-dimensional graphics, communications module, and time-management capabilities. It features a four-function calculator, macros, full-color capability, and extensive use of windows. The only things missing are a clock and a programming language.

This program for the IBM PC is aimed at business people who need ready access to all the major computer applications. Yet the documentation doesn't make it particularly easy for you to access these applications. The on-line help screens ameliorate to a certain extent the problems with the cryptic documentation, but they can't replace good written instructions.

Once you go through the laborious process of learning Open Access's secrets, however, you can do some wonderful things with incredible ease. For example, I had a great time creating surface plots with the three-dimensional graphics capabilities using numbers that I had stored in the database and manipulated with the spreadsheet.

Data can be output from most of the modules and used as input to the others, making data transfer between applications almost painless. Open Access gives you two ways to move data from module to module. You can export the information to the disk and then import it into another application. Or with Open Access's context function, you can use the internal memory as a conduit. But this is the extent of the integration. If you make a change in your database and that information is also

in a word-processor document, the data in the word-processor file is not automatically updated. This is not a significant detraction for Open Access; many integrated packages handle data transfer similarly.

General Features

Open Access comes on five floppy disks, which include a getting-started disk, a tutorial data disk, a boot disk, and two program disks. When you first start the program, it asks you to enter the date and then displays a window containing the options menu in the upper right corner of the screen. From this point on, all your work is done within overlapping windows that appear and disappear without disturbing what is underneath them. When windows contain more than one window full of information, you can scroll through them up and down with the arrow and page keys.

Open Access makes extensive use of the PC's function keys, allowing you to move through the program easily with single keystrokes. For example, pressing F1 will display a help window appropriate to the context in which you're working. The definitions of all keys can be displayed at any time by pressing F1 twice. Most keys have the same or similar functions in all modules with a few subtle differences. The Undo function, which usually cancels your last action, is a frequent lifesaver.

Throughout the modules, all currently available commands appear on a menu at the bottom of the window. You type either a command's first letter or highlight it and press whatever key executes commands. To get help on the commands, you highlight the command and press F1.

Two excellent features are the calculator and search windows. The calculator is usually available and

provides arithmetic with parentheses, adjustable precision, and a running total. The search window is available whenever you need to call a file to the screen. It lets you scroll through a list of files appropriate to the module and, if you don't want to bother typing the file's name, you can simply stop scrolling on the one you want and choose Do. This lets you retrieve files without going to the operating system and calling up the directory. Unfortunately, the search windows don't list a file's length, time of last access or creation, or free space available on disk.

Macros, which are procedures you define and assign to a key, can be recorded in a file and played back when necessary. They can consist of keystrokes, pauses, messages, and comments and are limited to situations where exactly the same series of keystrokes is used to perform specific tasks on a regular basis. (This is not a procedural language.) You can edit the macros with a utility that's included. The number of macro files you can have is limited only by disk space.

The documentation, in spite of its bulk, is rather poor. It does a good job of walking you through a script demonstrating the choices on each menu but says little about putting them to use in complex situations. And I found many references to nonexistent sections. The reference manual is a slim volume devoted to the information manager, with no technical information or details on program capacities.

Software Products International plans to introduce updated versions of Open Access with new documentation. Marketing plans include selling the modules individually as well as in groups of two or three. Each module will cost roughly \$200. All registered owners are notified of new releases and can purchase updates for \$90 a year.

Information Manager

The relational database manager has excellent features but is somewhat limited in capacity. It can handle 32,000 records and 55 fields per

record to a maximum of 1024 characters per record and 59 characters per field. But what this module lacks in capacity, it more than makes up for in ability.

You create the layout of a record by designing the fields for your data on the screen. As you create a field, you can open a window that allows you to define the type of data it will hold, its color, and whether it will be used for searching and sorting. Open Access has a rich variety of field attributes, including autodate, auto-increment, must fill, must match, range, and left, right, center, and repeat justification. In addition, you can change most of these attributes at will after you've entered information without losing data. You can also add or delete fields after you've entered data.

The browse function is also well implemented. One window shows the key fields of 16 records at a time, and as you move up and down the list, each entire record is displayed in a neighboring window. You can update the record using the change function and go back to browsing.

You can join up to five files at one time for display, updating, and reporting. You can retrieve records based on up to 64 conditions using a four-word subset of IBM's Structured Query Language (SQL) with recursion, and then sort by up to 15 fields. SQL in Open Access consists of four commands: From, Select, Where, and Order. You'd use the words thusly: From (list of file names) Select (list of fields) Where (search conditions) Order (ascending or descending by one or more key fields). The search window lists available file names and field names, making it very easy to set up searches using this powerful query language. Searching can be done even more simply by filling in search criteria on-screen.

You can easily design reports to include the results of calculations on fields, as well as headers, footers,

Victor Scheluchin is an independent microcomputer applications consultant, programmer, and writer serving the New York City area. He can be reached at POB 4432, Sunnyside, NY 11104.

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page numbers, dates, totals, and up to two levels of subtotals and five level-breaks, which allows you to print separate sections for up to five sort criteria. Print characteristics such as bold or underline are controlled by the Open Access system configuration files rather than by the report writer in the database.

The information manager includes a built-in mailer function for generating personalized form letters and mailing labels. You can move data directly to the spreadsheet, word processor, and graphics modules by choosing the context option from the main menu. Regrettably, there is no direct link from the database to the time manager.

Spreadsheet

The spreadsheet is very powerful and, unlike some of its competitors, imposes no arbitrary size limits on your worksheets. The size of your spreadsheets is limited only by the amount of memory you have. Open Access uses disk space to give you worksheets larger than what could fit in RAM. On a hard disk, you can have up to 216 columns by 3000 rows to a total of 648,000 entries.

Open Access's spreadsheet comes with many math functions built in, such as sum, count, sine, cosine, logarithm, square root, standard deviation, and variance. Built-in business functions include payment, present and future value, depreciation, and internal rate of return calculations. You can format cell contents in just about any way you like; a nifty update command lets you try temporary calculations and then restore the original contents. If you find the four-function calculator too limiting, the spreadsheet will calculate expressions on the command line using its advanced functions. You also can limit access to your worksheets with passwords.

The convenient goal-seeking feature lets you specify target values or "goals" for one or more variables and have the program compute the values of the variables that will meet those goals. Other features are named areas (which allow you to name

blocks of cells and refer to those areas by name in a formula); forward and backward references in formulas, printing and display of formulas with cross-references; linking of up to four spreadsheets; and consolidation of up to seven sheets with each capable of having up to 30 submodels.

The spreadsheet lets you set up and control customized windows. Up to four worksheets can be displayed at one time in up to six windows. You can connect the windows for vertical or horizontal scrolling in one direction at a time.

You can exit from the spreadsheet with or without saving your work; the save option retains information on screen splits, cell attributes, and setups such as menu- or command-driven operation and cursor move-

ment. You can move data directly to the information manager, word processor, and graphics modules by choosing the context option on the main menu. This is not the fastest spreadsheet, but it offers exceptional power, features, and flexibility.

Word Processor

The word-processing module is the weak point in Open Access. It is severely limited in capacity and very awkward to use. The maximum document size is 30K bytes, which translates to about 16 pages of normal, double-spaced text. Although enough for most tasks, this restriction is puzzling in a system that allows unlimited spreadsheet size.

It's unfortunate that a program that uses windows so well elsewhere provides this feature in the word processor in one way only. You can copy and move text within and between documents using a split screen, but cursor movement is restricted to one window and text transfer is in one direction only. The size limitation would be bearable if you could display and work with multiple windows and files.

Some word processors distinguish between insert and overstrike mode. This one adds a delete mode as well. Normally, the arrow keys move over your text without disturbing it. In delete mode, however, if you move your cursor to the right, a character is deleted. If you move it down, a line is deleted. Moving left and up restores deleted text. It's easy to lose track of which mode you're in and unintentionally delete a few lines. You can get your text back. But all in all, this arrangement takes a lot of getting used to.

Special printing characteristics such as bold, underline, and italics are displayed on-screen either in a different color or reverse video depending on your system. This is a great idea that simply doesn't work. For example, if you designate a sentence to be printed in boldface and then decide you want italics, you have to delete and then retype it.

If you can live with these aggravations, the rest of the word processor

At a Glance

Name: Open Access, Version 1.01

Type

Integrated package: relational database, spreadsheet, word processor, three-dimensional graphics, communications, and time manager

Manufacturer

Software Products International
10240 Sorrento Valley Rd.
San Diego, CA 92121
(619) 450-1526

Price

\$695

Format

Five 5¼-inch floppy disks

Computers

IBM PC, XT, AT, and compatibles with DOS 2.0 or later; Apricot, AT&T PC 6300, Data General One, DEC Rainbow, Ericsson, Hewlett-Packard HP 150, Monroe MS2000 Series, NCR, Olivetti, Tandy 2000, TI Professional, and Wang; requires 256K bytes of user memory, two double-sided double-density disk drives or a hard disk; color or monochrome graphics board

Documentation

User's manual, getting-started and pocket reference booklets, reference card, and function key template

Audience

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Options

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page numbers, dates, totals, and up to two levels of subtotals and five level-breaks, which allows you to print separate sections for up to five sort criteria. Print characteristics such as bold or underline are controlled by the Open Access system configuration files rather than by the report writer in the database.

The information manager includes a built-in mailer function for generating personalized form letters and mailing labels. You can move data directly to the spreadsheet, word processor, and graphics modules by choosing the context option from the main menu. Regrettably, there is no direct link from the database to the time manager.

Spreadsheet

The spreadsheet is very powerful and, unlike some of its competitors, imposes no arbitrary size limits on your worksheets. The size of your spreadsheets is limited only by the amount of memory you have. Open Access uses disk space to give you worksheets larger than what could fit in RAM. On a hard disk, you can have up to 216 columns by 3000 rows to a total of 648,000 entries.

Open Access's spreadsheet comes with many math functions built in, such as sum, count, sine, cosine, logarithm, square root, standard deviation, and variance. Business functions include present and future value calculations, and internal rate of return. You can format reports in just about any way. A nifty update command stores the original content. You can find the four-function calculator, limiting, the spreadsheet, late expressions on the line using its advanced features. You also can limit access to worksheets with passwords.

The convenient goal-setting feature lets you specify target "goals" for one or more variables and have the program calculate the values of the variables that meet those goals. Other features include areas (which allow you

blocks of cells and refer to those areas by name in a formula); forward and backward references in formulas, printing and display of formulas with cross-references; linking of up to four spreadsheets; and consolidation of up to seven sheets with each capable of having up to 30 submodels.

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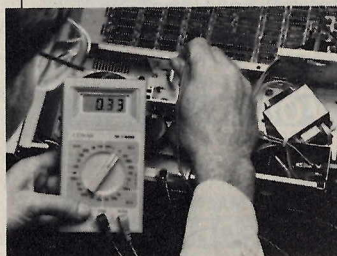
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is a piece of cake. You can store up to eight paragraph formats and call them up at will, work with documents up to 199 characters wide, and combine text and graphs from other documents when printing. The program fully supports justification, page numbering, headers and footers, and comes configured for a wide variety of printers and plotters.

You can place up to eight markers in your text and define 10 abbreviations that are automatically spelled out when you type the abbreviation. Scrolling is much faster than in the database or spreadsheet and you can order a document to be "printed" on the screen with headers, line spacing, footers, and page numbers to see how your document looks before committing it to paper.

Graphics

If your computer has color graphics capability, you can feast your eyes with this module. Its only shortcomings are that you cannot control the size and placement of axis labels and it has no free-hand mode. You can have up to 30 levels and 30 positions of data (that's 900 items) and up to 10 axis divisions in one graph.

Within these fairly generous limits, the graphics module gives you complete control over the appearance of your data. You can switch easily between line, pie, and bar graphs. Bar graphs can be simple or three-dimensional. The simple graphs can be windowed or overlaid in mixed types and sizes, and pie charts can be exploded into sections. You can individually change the background color and palette as well as set textures and colors. The three-dimensional bar graphs let you pick the colors and textures of the grid and adjust its tilt and rotation.

You can manipulate not just the appearance of your data but its value as well, thus letting you see the effects of changes quickly. You can then update the file the data came from without leaving the graphics module. When you get something you like, the program allows you to save your graphs on disk and to link

up to 30 of them for a slide-show-like presentation. If you have a graphics printer, you can print graphs in color or black and white.

Communications

The communications module is a mixed bag. Its attractive features are the ability to send and receive files limited in size only by disk space, automatic dialing of up to 10 phone numbers per configuration file, and having multiple configuration files that can be easily installed. You can set up a master-slave mode between two computers that are both running Open Access. This allows the master to send, receive, delete, and rename files on the slave.

The master-slave mode is extremely slow, however, and gives little indication on-screen of what's going on. Often the keyboard on the master is dead, and it's easy to assume that the program has crashed. This leads to some entertaining effects, as any keys you press at this point are remembered and acted on after control is regained.

The menu structure gets in the way in this module because you must navigate multiple levels to open and close a log file. This forces you to record an entire on-line session for fear of missing something important, leading to larger log files than necessary. If you want to edit these files with the word processor, you must keep in mind its 30K-byte document limit and its inability to handle nonalphanumeric characters such as form-feeds, control codes, and the spurious garbage I often get when connecting and disconnecting the modem.

Time Management

The time manager is fine in its own right but suffers from not being well integrated into the system. It features a rotary card file for names, addresses, and phone numbers, but neither this nor the other time-manager files can be directly accessed by the information management module.

The calendar can handle the years from 1970 to 1999 and for each date

you can enter a four-line note. Also with each date you have a 24-hour appointment log with space for information on name, time, subject, and short notes. The program does not automatically mark the calendar dates to indicate existing appointments or notes, but you can type and save your own marks.

Regularly scheduled appointments are easy to set up, and the module warns of conflicts without forcing you to cancel them. You can search by name and subject and print one day's schedule. The module can handle an unlimited number of calendar files. Appointments, scratchpad notes, and address cards are stored in separate files, each with a capacity of 32,000.

Conclusion

Before I could totally recommend Open Access as a serious business tool, I would very much like to see it fully debugged and its inconsistencies smoothed out. I would feel better about entrusting my valuable information to Open Access if getting the data in and out of the system were a smoother process. Better—not more—documentation is required to clearly explain the limits and capacities of all the modules.

Even though Open Access can be used on a floppy-disk-based machine, each data disk must contain a varying number of system files and it is necessary to switch back and forth between three disks when moving from module to module. For heavy use you will need a hard disk or a lot of patience.

In spite of its rough edges, I like Open Access. The easy database/spreadsheet/graphics combination is hard to beat. The seemingly hefty price tag turns out to be a bargain when spread out over the six major functions—even more so when you consider its visual appeal and the designers' attitude that using business software should be easy and fun. Although Open Access falls short in many areas, this is a young product with a lot of potential. I look forward to watching it grow and mature. □

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DATABASE

Please

Flexibility in designing fields makes this file manager from Hayes suitable for a broad range of applications

by Charles Spezzano

Data management software is hot. Software publishers are chasing this rapidly expanding market like greyhounds racing after the mechanical rabbit. A particularly vigorous competition is currently underway among those programs known as file managers. Please, a finely tuned file management program for the IBM PC, is one of the youngest contenders in the race.

File managers are generally thought of as the easiest of the database programs to learn and operate. By the same token, they generally have fewer features than the high-end programs. Please, while easy to learn, has enough power to satisfy the needs of most professional and business users. Indeed, because of its data-entry standards, it is especially well suited for managers who want to create a file management system that other people will operate.

Programs of this sort handle only one file of similarly formatted records at a time and are generally menu-driven. With any of these file managers, you first create a data-entry form with blank fields. Then you fill in those fields for each of the records in the file, thus creating your database. You do all this so that you can later search quickly for particular records or print reports and mailing labels. Sometimes data must be transferred to or from other programs. Please is especially strong in two areas—the flexibility of its field types and record structure and the number of different programs with which it can exchange data.

File management software can be divided into two major categories depending on how it defines its fields: text-oriented or structured. Usually a program supports one to

the exclusion of the other, but Please combines field types associated with both categories.

Text-oriented programs allow you to put many lines of words and numbers into a single field and search the file for records that contain a particular word in that field. The price you usually pay is loss of control over the kind of data that you can enter into one of those fields. Letters can end up in fields intended for numbers and \$1000 can find its way into a field you designed for amounts from \$1 to \$10. Because of this lack of control over data-type entry, text-oriented programs are less than ideal for many business applications.

By contrast, the structured programs allow you to set requirements for the type and range of data that you can enter into a field. With this method, however, field lengths are often too small for a paragraph of comments on a book or journal article abstract you might want to file.

Please is one of the few file managers that straddle the fence between these two categories. It offers four field types: character, numeric, date, and yes/no. You can set a maximum length for each field of up to 999 characters, create required fields that cannot be skipped over, and set a default value for a field so that a date, phrase, or number appears there automatically. You can search for records that contain a keyword used in one of those fields. Upper and lower limits can be defined to ensure, for example, that no one gets a 200 percent raise.

Unique key fields prevent the erroneous duplication of records. If someone tries to enter the same social security number into the key fields of two different records, Please will catch the error. These structured field types and data-

checking features enable Please to handle sales data and customer records efficiently.

Similar to its ability to handle many types of fields, Please can import and export data in all the major PC formats. Please automatically stores its files on disk in ASCII format, so any program that works with this standard format can handle Please data.

In addition, Please can read and write DIF (Data Interchange Format) files in order to exchange information with applications software like Lotus 1-2-3 and Visicalc. Please can also read and import BASIC files, as well as trade files with Ashton-Tate's dBASE and Friday programs. The manual contains detailed instructions for exchanging data with six popular software packages: 1-2-3, Visicalc, Easyfiler, dBASE, Wordstar, and Visiword.

According to the technical support people at Hayes (who responded in a friendly and knowledgeable style to all my questions without my having identified myself as a reviewer), you can send Please files through a Hayes Smartmodem and Smartcom II software on your IBM PC to an Apple II equipped with the same communications software and hardware, and when the data arrives, it can be read by programs like Apple Writer.

Printed Matter

Please's documentation is clearly written, logically organized, and very informative. The 18-page "Ready, Set, Go!" mini-manual directs you in making working copies of Please for both floppy- and hard-disk systems. It then guides you step by step through a quick and efficient tutorial. If you want more book learning before handling the program, the 200-page main manual provides a glossary and written tutorials in every section and each one is related to the sample database on disk. If you have never used a file

Charles Spezzano runs SPCU (Society for the Prevention of Cruelty to Users), an IBM PC research project in Denver, Colorado.

manager, these simple exercises will put you at ease. And to further soothe the anxiety of new computer users, context-sensitive help messages are readily available on-screen.

Please is run by a system of menus, all of which use the PC's function keys to execute commands. Menus, such as Please's, that cannot be bypassed with keyboard commands can get tedious if you use a program every day, but they do facilitate getting started.

The master menu appears automatically whenever you start Please. It offers 10 choices: choose a database to use, add/change/delete/scan records, produce a quick list, output plan support menu, process and output plan, database utilities menu, create a new database, describe printer and/or communications port to use, exit from Please, and call for help. The F10 key is the help key on this and all other menus.

Creating the Data Entry Form

Everyone's journey through Please starts with the master menu option for creating a new database, which takes you to a menu for setting up the fields in each record. Please allows you to include up to 9 pages (screens), 99 fields, or 2000 characters in a record, whichever comes first.

Press the F3 key and Please asks you to name your first field. This is an important moment in your Please journey because the first field in each record is the key field. Please orders all records in a database according to what's in that first field. Records also appear on-screen in that order whenever you retrieve them.

The fields you have defined will appear one under the other on the screen when it's time to fill in the blanks. You have the option, however, of designing a customized data-entry screen.

You have to spend some time thinking about the design of your data-entry form before you use it. Please limits the quick changes you can make in a database after you have stored information in it. You can easily change field names, default values, the upper and lower limits of a numeric field, and the status of a field from required to nonrequired and vice versa. But you cannot add or delete a field or change field length unless you first copy the database structure, then modify the copy of the database structure (which is now empty), and finally merge the database into the newly modified copy—a time-consuming process.

A Shortcut to Your First Database

If designing your own forms seems like too much work, you can buy ready-made applications templates for \$29.95 each. These are predesigned data-entry and report

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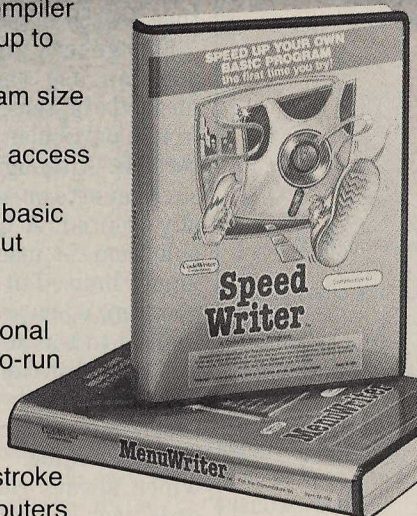
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forms that allow you to start entering information and generating reports without creating your own database structure. You just call a template to the screen and start entering data.

Thirteen templates are available: Applicants, for keeping track of people interviewing with your company; Appointments, to help you manage time more efficiently; Contacts, for organizing sales information; Customer Invoicing/Reporting, an automatic accounting and information system for accounts payable; Employee Files, for organizing employee information; Financial Reporting, which helps determine operating income before taxes; Household Records, which includes templates for Home Finance, Home Documents, Home Library, and Home Music Collection; Inventory Control, for monitoring stock activity; Invoices, which organizes customer sales and related data; Mailing List; Membership, for managing group and club activities; Payroll Reporting; and Stocks, for keeping an up-to-date tally of your stock portfolio. (You get one template free when you mail in your Please purchase registration card.)

I worked with Mailing List for this review. It came with its own well-written manual, one data-entry screen with 12 fields already defined (these can be modified before you start entering data), and a comprehensive collection of 12 reports (output plans). This template's format is flexible enough to cover most mailing-list applications.

Now that you've defined the fields in your database you can begin adding records. You move from blank space to blank space and fill in each one, as with all file managers. These programs vary, however, in the ease with which you can navigate around the data-entry screen. Some let you move anywhere you like, entering and editing data. Please, by contrast, offers only a one-field-at-a-time editing capability. If you are in the middle of filling in a record and you notice an error in a previous field, you have two options, both tedious.

You can either make a note of that error and select that field by number for correction after you finish filling out the record, or you can scroll back through the record field by field with the F1 key, erasing everything in your path along the way.

A notable aspect of Please's data-entry method is that each record is automatically written to disk as soon as you complete it. This takes a few extra seconds, but it also minimizes data loss if power to the computer is interrupted.

But What Does It Give Back?

Please gives you several ways to retrieve information from a database. Basically, the method you choose depends on whether you want to view records on-screen or print reports. For viewing or modifying records on-screen, you'd use Please's scan function. Similar to what other programs call the search function, scan lets you instruct the

program to find a particular record or subset of records from a database using criteria you provide.

If, for example, you kept a file on all your relatives and you wanted to borrow money from one of them, Please would let you start with the first or last record in the file and scan forward or backward until you found the ones you want. That works well if you have only about 20 or 30 records in the database, but if you have 1000 relatives on file, it would be tedious to flip through all of the records looking for the ones with large enough amounts in the yearly income field to make them likely prospects for your loan. That's why file managers are equipped to search through a database and pick out just the records that meet certain criteria.

Please searches only one field at a time and always sorts on the key field. If you choose the yearly income field to scan, Please will ask you to specify a scan test, its term for a search criterion. The choices include equal to, less than, greater than, begins with, contains, and true or false (for yes/no fields). To find rich relatives you would choose greater than as the scan test and \$100,000 as the scan value. Please will find all the records that meet that search criterion.

For generating printed reports you can use one of Please's two methods of selecting certain fields from a particular record or subset of records. Although you may display such reports on-screen, they're usually printed. A Quick List is available from the main menu. You are no longer limited to one search field as you were when scanning, nor are you limited to the key field for sorting, but you still can sort on only one field per Quick List and only in ascending order, from lowest to highest value. Unlike scanning, which always retrieves whole records, you can specify which fields you want to appear in a Quick List report.

If you want the greatest flexibility Please has to offer in selecting records or designing custom reports,

At a Glance

Name: Please

Type

File manager

Manufacturer

Hayes Microcomputer Products Inc.
5923 Peachtree Industrial Blvd.
Norcross, GA 30092
(404) 449-8791

Price

\$349

Format

5¼-inch floppy disk

Computers

IBM PC, XT, and compatibles with 128K bytes of user memory and DOS 1.1 or higher; requires two floppy-disk drives or a hard disk

Options

Application templates, \$29.95 each

Documentation

18-page "Ready, Set, Go!" startup tutorial and 204-page illustrated "Users Guide" with glossary and index

Audience

Anyone who needs a simple but versatile file manager for professional or business applications. Especially suitable for managers who want to create a file management system that other people will operate

you'd use the output plan support menu. This report generator is logically designed and works quickly. You can select records that satisfy all or any of 15 conditions, and within each of those conditions you can further specify 3 subconditions. Thus, you can ask Please to find all the records of your relatives who earn more than \$100,000 per year OR own more than \$1 million in stocks and bonds AND have no dependent children AND live in New York OR New Jersey OR Connecticut. These records can be sorted on five fields, in ascending or descending order.

Multiple-report formats, including 50 list reports and 50 form reports, can be created and saved for each file. Both list and report formats allow for a maximum width of 240 columns and a maximum page length of 200 lines. It is only in setting up report formats that Please creates calculated fields, that is, fields derived from a mathematical

combination of two other fields. If, for example, you collect and sell rare books, each record in your book catalog database might include a purchase price and the amount for which you eventually sold each volume. In a monthly report, you might want to include a profit field that does not exist on the data-entry form. Please allows you to set up this new field in a report and to define it as a calculation that will be derived by subtracting the purchase price from the selling price.

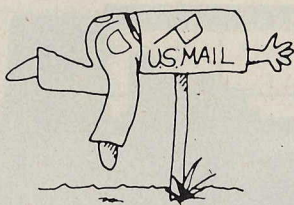
Lists and Summary Reports

Lists are reports in columnar format and can include totals, subtotals, averages, and minimum and maximum values for each column. You can also create summary reports, which print just the totals, averages, or minimum and maximum values for any fields in the database without printing the data in those fields from each individual record.

An alternative to list reports are form reports, which let you paint fields anywhere on the screen for a customized look or for generating reports onto preprinted forms. Mailing labels can be printed as well, but Please does not remove the trailing spaces from fields.

Please is a strong product in a hot and competitive market. It offers structured and text-oriented fields, templates to make an easy job even easier, and fairly flexible searching options. Learning the program isn't a nightmare; using it is straightforward. Conveniently, it gets along well with a broad range of other software. Some awkwardness in editing data on-screen and in modifying the database structure after you've begun to enter information are minor drawbacks in an otherwise first-rate product. Backed by a well-known company with an excellent support staff, Please is definitely a top contender in its class. □

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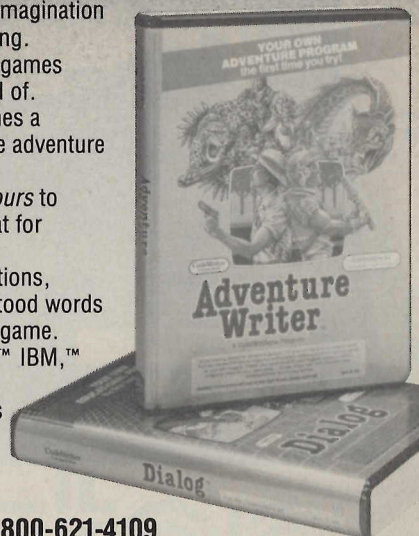


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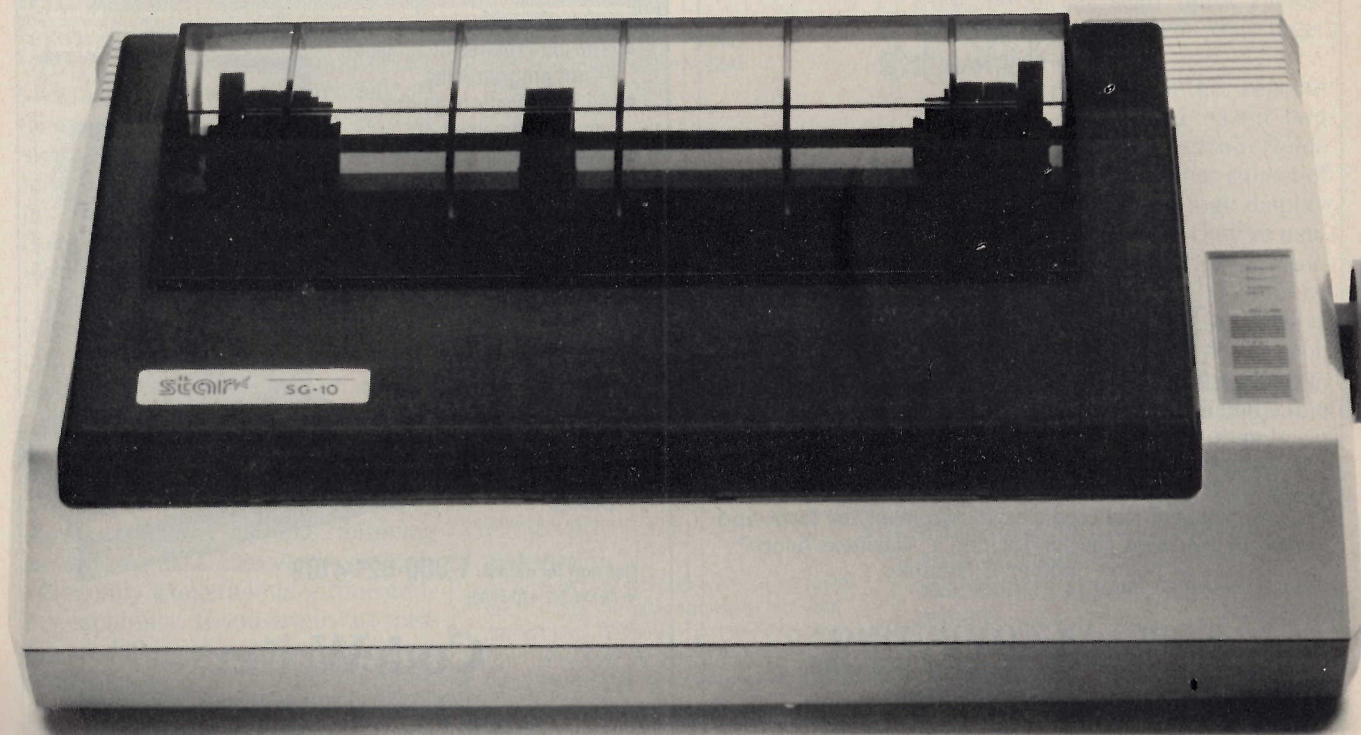
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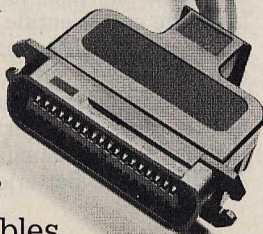
In fact, on three of our new models, both draft and near-letter-quality are standard (no extra charge). A fourth model, the SB-10, prints draft and letter-quality standard (again, not extra).

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Inquiry 65

In most cases, hooking up is no more complicated than putting a square peg in a square hole. But it's a lot more rewarding.

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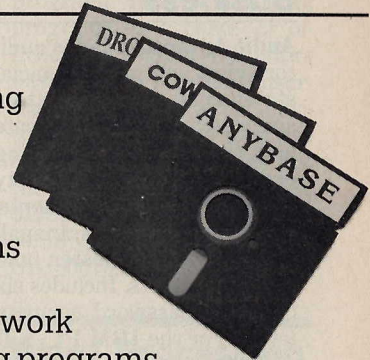
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NEW SOFTWARE

Business

Audit Advantage helps auditors view and print financial statements, prepare extensive analytical reviews, create lead sheets, make adjusting entries, and produce a variety of draft financial statements. The system handles annual, semi-annual, trimester, and quarterly audits. Includes six operator password security levels. For the **IBM PC, XT, and AT and Compaq**; \$3000. Informatics General Corp., MCS Division, 2400 Lake Park Dr., Atlanta, GA 30339.

DJBA Payroll Control Program handles six wage or salary rates per employee, up to eight customized deductions per employee, and full control of all tax rates. Other features include payroll sorting, an extensive array of reports, and error-correction and update modes. For the **IBM PC, XT, AT, and compatibles**; \$495. D. J. Bailey Associates, 3438 West 83rd Place, Chicago, IL 60652.

Miracle is an integrated software package that provides telecommunications, electronic spreadsheet, graphics, and word-processing applications, using a window format. For the **IBM PC and compatibles**; \$299. Micro-Systems Software, 4301-18 Oak Circle, Boca Raton, FL 33431.

Omnifile lets you exchange data between programs using either DIF or defined-ASCII-format files. The system works with Visicalc, Wordstar, Lotus 1-2-3, dBASE II, and many other applications packages. Omnifile is menu-driven and offers single-keystroke commands. For the **Victor 9000, Wang Professional, and IBM PC and compatibles**; \$425. SSR

Business Accountant

This double-entry business accounting system provides general ledger, accounts payable, accounts receivable, inventory, payroll, and system manager modules. The program elements can be used individually or integrated to form a complete package for

*small- to medium-sized businesses. Generates more than 100 reports. For the **Apple IIc and IIe**; \$95 (system manager); \$345 (payroll); \$295 (other modules). Manzanita Software Systems, Suite 200-A, One Sierra Gate Plaza, Roseville, CA 95678.*



Corp., 1600 Lyell Ave., Rochester, NY 14606.

Tax Machine is a federal and state income tax preparation system designed for tax professionals. Features include pro forma and letter of instruction preparation, automatic pricing, multiple printing options, and error trapping. Supports more than 35 types of forms and schedules. For **MS-DOS, Unix, and Xenix-based systems**; \$1495. Accountants Microsystems, 3633 136th Place S.E., Bellevue, WA 98006.

Taxplan determines corporate federal tax liability for companies of all sizes. The program analyzes and reports on taxable income, net capital gain, charitable contributions, dividends received, net operating loss, tax before credits, foreign tax credit, investment credit, new jobs credit, R & D credit, and minimum tax.

The program can be used to generate historic calculations back to 1966 or prospective calculations until 1990. For the **IBM PC and XT and Compaq and Compaq Plus**; \$495. Ernst & Whinney, 2000 National City Center, Cleveland, OH 44114.

Graphics

B/Graph generates a wide variety of business graphics, including pie charts, two- and three-dimensional bar graphs, segmented/stacked bar graphs, and line and area graphs. It also provides up to 100 data points, the ability to graph up to three factors, automatic labeling, foreign-language and scientific characters, and a full-screen data editor. Works with most graphics printers and many printer cards and interfaces. For the **Apple II family and Ataris**; \$69.95. Batteries In-

cluded, Suite P, 17875 Sky Park North, Irvine, CA 92714.

Scientific Plotter-PC helps you produce professional-looking graphs of scientific or business data. The system generates line plots, bar graphs, pie charts, and stock charts. Features include variable height and width axes, semi-log and log-log scales, 20 plotting symbols in four size ranges, user-positioned labels, and variable-length error bars. Supports the Microsoft Mouse and IBM, Epson, Okidata 82, C.Itoh 8510, and IDS graphics printers. For the **IBM PC**; requires color graphics adapter; \$95. Interactive Microware, POB 139, State College, PA 16804.

Education

Alert! The Game of Kids' Safety helps children discuss the disturbing subject of child abuse with parents or teachers. The game features text and cartoon characters that present information in a non-threatening manner. Includes a user's guide plus 50 "I'm Alert" stickers. For the **Apple II family**; \$39.95. Panorama Projects, POB 281, Manitou Springs, CO 80829.

Complete Writer is a three-disk program that helps students in grades 5 through 10 improve their writing. The system teaches such fundamental skills as note-taking, outlining, organization, and proofreading. It also teaches students how to deal with specific writing problems ranging from sentence fragments to use of quotations. For the **Apple II family**; requires Bank Street Writer word processor; \$99.95. Learnco Inc., 128 High St., Greenland, NH 03840.

Consonant Combo, a set of three educational games, covers beginning consonants, consonant binds, and consonant digraphs. The programs feature graphics, animation, optional sound, and immediate reinforcement. Players control the speed of the activities. For ages 5 to 8. For the **Apple II** family; \$69.95. McCarthy-McCormack, 1440 Oak Hills Dr., Colorado Springs, CO 80919.

Kinderware is a package of six light-pen programs for children ages 4 to 9. Math Fun, Alphabet Fun, Memory Jogger, Connect-A-Dot, Shapes and Colors, and Simon Sez help develop basic verbal, numeric, and memory skills. For the **Commodore 64** and **Ataris**; Tech Sketch Light Pen required; \$34.95. Tech Sketch, 26 Just Rd., Fairfield, NJ 07006.

Welcome Aboard

In Welcome Aboard the Muppet gang takes you on a cruise to computer



cessors, electronic spreadsheets, and other applications; \$49 each (\$79 for both). Macadam Publishing, POB 69001, Portland, OR 97201.

CBIO System is a biorhythmic profile report generator. The system produces a monthly six-page report that provides a day-by-day interpretation of all biorhythm factors. For the **Radio Shack TRS-80 Models III and 4**; \$155. Bluebirds Computer Software, POB 339, Wyandotte, MI 48192.

Desktoppers offers four mouse-driven programs: a perpetual calendar, the Little Black Book database, Doodle Pad, and Music Maker. The calendar covers dates from 1904 to 2003; the database stores and alphabetically sorts up to 26 pages of names, addresses, telephone num-

literacy. Players learn to program the S. S. Microship's course, use computer-aided design techniques to glamorize Miss Piggy, play an arcade game, use word processing and electronic mail, and manage Fozzie Bear's database of terrible jokes. For the Apple II family; \$34.95. Broderbund Software, 17 Paul Dr., San Rafael, CA 94903.

Home

Calendar and Phone Book are perpetual calendar and phone book/dialer programs for the **Apple Macintosh**. After installation, both programs become an integral part of the Mac's menu and are accessible from word pro-

cessors, and other data; the doodle pad lets you insert sketches into a report or store images in an electronic scrapbook; Music Maker enables you to create, play, and save three-voice melodies. For the **Apple Macintosh**; \$49.95. Harvard Associates, 260 Beacon St., Somerville, MA 02143.

Technical Tools

Command/Assist is a disk-based version of IBM's DOS manual. The program, which allows keyword searches, provides comprehensive explanations and examples of all PC-DOS/MS-DOS commands. For the **IBM PC, XT**, and compatibles; \$49.95. Gary Atwill and Associates, 400 N. New York Ave., Winter Park, FL 32789.

Diversi-Dial turns your computer into a Compuserve-like CB simulator. Up to seven callers can chat with each other simultaneously. Requires no passwords or connect charges, but system operators may raise funds through caller donations. For the **Apple II** family; requires seven Apple Cat II modems; \$50. Diversified Software Research, 5848 Crampton Court, Rockford, IL 61111.

Omniterm 2, a telecommunications program, offers unattended operation, XMODEM support, full- and half-duplex modes, and definable handshaking protocols. Also provides DEC VT100 and VT52 emulation. For the **IBM PC, Radio Shack TRS-80 Models I, II, III, 4, 12**, and **Tandy 2000**; \$95 to \$175, depending on computer. Lindbergh Systems, 49 Beechmont St., Worcester, MA 01609.

Personality+ II lets your computer function as either a NAPLPS or ASCII terminal. The program features data uploading and downloading, a telephone directory, and slide shows. For the **IBM PC** and compatibles; \$240; IBM or Plantronics color board required for color graphics. Microstar Software Ltd., 14 Concourse Gate, Nepean, Ontario K2E 7S6, Canada.

Remote, a remote console program, lets callers run programs on a home- or office-based computer. It offers password protection, user-transparent operation, electronic mail, and the ability to send broadcast messages. For the **IBM PC** and compatibles; \$195. Microstuf, 1000 Holcomb Woods Pkwy., Roswell, GA 30076.

Word Processing

MX Set gives you easy access to your Epson MX series printer's special features. The program lets you enter into your text files commands for underlining, compressed and expanded text, character set, font style, form size, and line-spacing. Built-in batch controls allow unattended printing runs. Includes an extensive array of help screens. For the **IBM PC, XT, AT, PCjr**, and compatibles; \$23. On-Disk Software, POB 661, Lincoln, MA 01773.

Wordease offers word processing with multiple windows and pull-down help menus. It also provides on-screen formatting, proportional spacing, and various character styles and sizes. Compatible with ASCII and DIF formats. For the **IBM PC, XT, AT**, and compatibles; \$400. Software Solutions, 305 Bic Dr., Milford, CT 06460.

New Software provides up-to-date listings of recent releases in microcomputer software. Descriptions are based on information supplied by the manufacturers and are not to be considered endorsements of the products. Companies continually offer new versions of popular programs for different machines. Please check with the manufacturer or a dealer to find out if a program is available for your computer. For in-depth evaluations of some of these programs, see our Software Review section.

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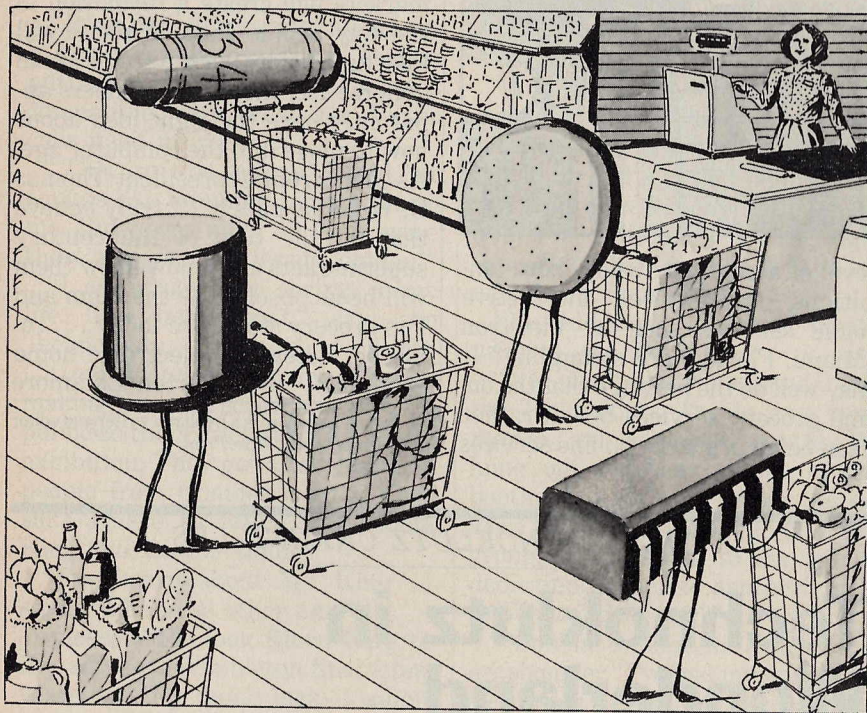
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A wide-ranging look at ways to get more from your personal computer

On-line
Grocery Shop-
ping on the
Way
Page 141

Technoklutz in
Wonderland
Page 142



On-line Grocery Shopping on the Way

Do you really *enjoy* your weekly trip to the supermarket? Probably not. But because we all have to eat, we tend to accept grocery shopping as one of life's little chores. However, if the success of a couple of pilot projects in Kansas City and Seattle is any indication, your home computer may soon provide you with the latest wrinkle in shopping convenience: on-line

grocery stores in which your keyboard and modem replace the traditional shopping cart and long check-out lines.

Guaranteed Foods' Menutronics system, based in Lexena, Kansas, and Shuttle Corp. of Redmond, Washington, have both had encouraging responses to their on-line grocery services, suggesting that such conveniences will soon become

available on a much wider basis. Both services allow shoppers to use their own microcomputers (or leased terminals) to send their orders over the phone lines to a central computer that processes them. The groceries are then delivered, C.O.D., to their doors.

Although the two services have been in operation for less than a year, they have attracted considerable interest in the communities they serve. Their primary appeal is not savings—essentially, they charge full retail price—but convenience.

Menutronics customer Luke Tardy of Overland Park, Kansas, says, "I don't have to stand in line and I don't have to carry groceries to my car in bad weather. All I have to do is open the front door to receive my groceries." Tardy says he does save some money, though, because Menutronics makes him plan his purchases more carefully and limits impulse buying. Also, he saves the cost of driving to the store.

Both on-line services are extensions of established home-order grocery companies. Guaranteed Foods, for instance, was established in 1958 and today is nationally known for its high-quality meat. However, Menutronics is not just a computerized version of Guaranteed Foods' normal grocery ordering service—it's more like the telephone ordering services of the Mom and Pop groceries of a generation ago.

Guaranteed Foods' traditional customers order by the freezerful, buying six months' supplies of

frozen, canned, and dry foods at discounts of 20 to 40 percent. On the other hand, on-line Menutronics customers typically buy more often and in smaller quantities—orders average about \$100, and there is no discount. Menutronics customers can choose from the same selection offered to bulk purchasers, as well as from a broad array of fresh fruits and vegetables. The choices are extensive enough that many Menutronics customers never go inside a grocery store.

Wide Appeal

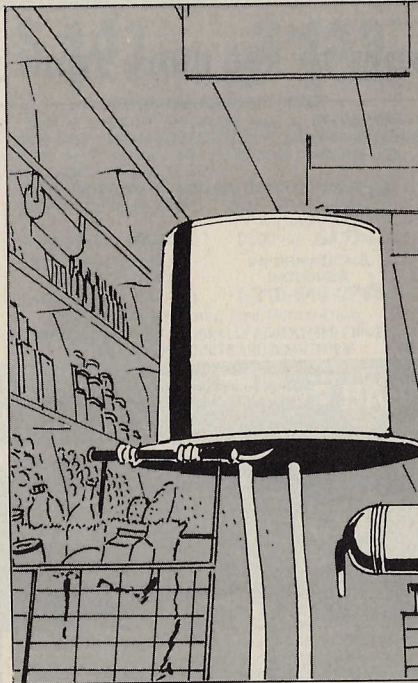
On-line grocery services offer clear benefits to many groups, ranging from young career people with busy lifestyles such as Tardy to elderly persons with limited mobility. Myrl Carpenter of Lenexa, for instance, is a widow in her 80s who does not drive. She was one of the first to sign up for Menutronics last July. Not your typical home computer user, Carpenter accesses the service through a terminal she rents from Guaranteed Foods, and like Tardy, she is very happy with Menutronics.

"I find the service very good, delivery service excellent, and the driver very courteous," she says. "As I live alone I order about \$100 worth once a month and store it in my freezer. Last winter I shared with my elderly neighbors." Menutronics has helped Carpenter maintain her independence and depend less on her married daughter.

Convenience is not the whole story, of course. Ordering food by computer also demands trust because customers cannot inspect their purchases before they buy. Conscious of this since the company's early days, Guaranteed Foods has made quality its first priority. The result is that customers have no hesitation about ordering meat and fresh foods sight unseen. "I have complete confidence in their products," says Tardy.

The Right Approach?

Why are Menutronics and Shuttle Corp. meeting with an encouraging



level of acceptance while more ambitious, multifaceted interactive home services such as Viewtron (Miami, Florida) are struggling? It may well be the heritage that the on-line grocery services boast: rather than being primarily on-line services

that are trying to break into the grocery business, they are successful grocers first and on-line services second.

The on-line home services industry would do well to read a lesson here, for it seems that delivery of a respected product is more crucial than any bells and whistles attached to the method of delivery.

Services such as Menutronics and Shuttle that can offer the convenience of on-line shopping together with the quality customers have come to expect from traditional markets will create a revolution in the way people shop. While it will take time before such systems are in general use, these two pioneers apparently have the right idea about how to move into the computer age. As Menutronics' president Thomas G. Williams puts it, "I truly believe that by the turn of the century supermarkets as we now know them will be as obsolete as the Mom and Pop grocery stores are today . . . replaced instead by electronic home shopping." —G. Berton Latamore

G. Berton Latamore is a freelance writer and editor of the newsletter *VideoPrint*.

THE TECHNOKLUTZ CHRONICLES

Technoklutz in Wonderland

A pine sapling," said the Technoklutz, laying it proudly on my den table, "a deck of cards, an electric shaver, a coffee mug that changes color when you fill it, and a purple yarmulka."

"Where'd you get all that stuff?" I inquired.

"Comdex," he crowed. "The computer dealers' exposition in Las Vegas."

"Oh," I said. "And how were the computers?"

"All right, I suppose. But what's the big deal? You turn them on, they light up, you type into them, you

turn them off."

"Don't you read the magazines?" I asked. "Computers are getting better all the time."

"Oh yeah?" said the Technoklutz. "I went to a news conference that Victor gave. You've heard of Victor Technologies?"

"Sure," I said. "That's the company that came out with the 9000 at about the same time the IBM PC hit the market. For four years, it's outperformed all of Big Blue's micros, including the AT. Victor went belly-up, of course."

"Except," he said, "that they're

trying to get back on their feet now. In Las Vegas, they announced a plug-in board for the 9000 that will slow the machine down, shrink its storage, and muddy up the screen, all for \$995—a pittance for a truly dynamic downgrade. Do you still think computers are getting better?"

"They're talking IBM-compatible," I pointed out. "That board could be a set of golden handcuffs."

"Maybe you're right," conceded the Technoklutz. "I noticed that one of the busiest booths was Apricot."

"Apricot?"

"It's a British company, apparently pretty popular over there. They're putting it out that their machine is compatible with whatever Victor calls itself in Europe."

"They can't be serious," I said. "It sounds like lemming-compatible to me. But never mind all that—were there any good parties at Comdex?"

"I never saw such shrimp in my life. The best event," said the Technoklutz, "was given by the Citizen Watch Company. They're making dot-matrix printers now. To publicize them, they staged a tennis exhibition. They got a few hundred people from Comdex over to Caesar's Palace to watch Billie Jean King and Roscoe Tanner."

"I've heard about Ms. King," I said. "Who's the other one?"

"Roscoe? He took Bjorn Borg to five sets in a Wimbledon final a few years ago. By dumb luck—I admit it—they drew my name, and I got to play with Billie Jean against Roscoe and another lucky winner. I had just taken a lesson from Marty Hennessy over at the Desert Inn—he's the best pro in the country, by peer vote—and I was up for the game."

"How up?"

"I broke Roscoe's serve, that's how up. The first time he served to me, the ball zipped by on the forehand side while I stroked with the backhand. The second time, I made contact but it went a little long—about nine miles, I reckon."

"He must have been cowed by my power, though, because the next serve was a puffball, and the other

guy flubbed my return. Since Billie Jean won all her points, the game went into our column. Speaking of which, they also laid an 80-column printer on me."

"You did get lucky in Las Vegas," I congratulated the Technoklutz. "How did you do on the slots?"

"Not so well there. To tell the truth, I lost my stake. But it's not honest. There was a sign in the casino saying, 'Players Drink Free,' and when I asked for a Chivas Regal, the waitress said, 'Not on the nickel machine, honey.' Does that strike you as fair?"

"It's deeply wrong," I consoled him. "Did you see any celebrities?"

"And how!" the Technoklutz exclaimed. "First, I thought I'd spotted John Dvorak in the press lounge, but it turned out the dapper chap was from *Gentlemen's Quarterly*—still, I'm confident I got the right type. But later on, I landed the big one: Jerry Pournelle."

"No kidding," I said. "What's *número uno* like?"

"Not at all like I imagined," said the Technoklutz, "a big guy, *muy macho*, yet somehow gentle. We hung out together at one of the booths, talking to a techie. As we were leaving, he shrugged off a few groupies and spoke to me as one dedicated hacker to another."

"What did he say?"

"'Son, he told me, his arm around my shoulder, 'I've had my eye on you and I want to give you a shove in the right direction. You're too negative. You're afraid of these machines. Go in with a bad attitude and you're sure to meet with failure. Lighten up. Don't fuss, don't fidget, and don't worry—just do it.'"

"And what did you say?"

"I said, 'I'll try, sir, but I don't think I'll succeed.'"

"That's the spirit," I assured him. "Well, you certainly had a grand time at Comdex."

"Did I ever," sighed the Technoklutz. "Aren't computers wonderful?" —Stephen Banker

Stephen Banker's "Technoklutz" commentaries can be seen on the Public Television series *The New Tech Times*.

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Crazy Cancellation

by Michael W. Ecker

Mathematical errors can be very frustrating. But they also can be an interesting source of challenging problems, as this month's programming exercise indicates.

Let's take the fraction $\frac{16}{64}$. When you simplify this by dividing top and bottom by 16, you get the correct answer of $\frac{1}{4}$. That's elementary. But if you were a beginner in arithmetic, you might think that the sixes in both numbers cancel each other to

produce the correct answer. You'd certainly find yourself in trouble on future calculations involving fractions, and you might just flunk arithmetic. Nevertheless, this "crazy cancellation" works coincidentally for some fractions.

Your task this month is to find such coincidences with a BASIC program. For which fractions does this form of dummy division in fact give a correct answer? For simplicity, let's restrict the programming exercise to fractions less than 1. You also can limit denominators to numbers under 100.

Last month you tried your luck in a carnival game, rolling six balls down an alley toward slots numbered 1 through 6. If your total score was over 30 or under 11 in this familiar carnival game, you won. Our program, using random numbers to simulate the vagaries of such games of chance, shows how likely you are to win. Perhaps unlikely would be a better word! □

Dr. Michael W. Ecker is an associate professor in the Department of Mathematics and Computer Science at the University of Scranton.

Author's Note: I welcome comments and actively solicit new problems, with your solutions. Enclose a self-addressed, stamped envelope if you wish a reply. Address all correspondence to Dr. Michael W. Ecker, Contributing Editor, *Popular Computing*, 129 Carol Dr., Clarks Summit, PA 18411.

```

10 PRINT "Carnival Game Simulation"
20 PRINT
30 PRINT "In this game, you roll six balls"
40 PRINT "and see which 'alley' each ball"
50 PRINT "lands in. Alleys are numbered"
60 PRINT "1 to 6. Your score is determined by"
70 PRINT "the alleys you land in: Alley #1"
80 PRINT "gives you 1 point, and so forth."
90 PRINT "Any score >30 or <11 wins."
100 PRINT
110 INPUT "How many tries do you want (>1)";NT
120 IF NT<1 THEN 110
130 INPUT "Press RETURN to begin.";RT$
140 WI=0
150 PRINT "Round #","Alleys"
160 FOR CO=1 TO NT
170 PRINT CO,
180 SU=0
190 FOR B=1 TO 6
200 A=INT(6*RND)+1
210 REM Apple and C-64 and some others:
220 REM change line 130 to: A=INT(6*RND(1))+1
230 PRINT A; " ";
240 SU=SU+A
250 NEXT B
260 IF SU<=30 AND SU>=11 THEN 290
270 PRINT "*win*";
280 WI=WI+1
290 PRINT
300 P=WI/CO
310 NEXT CO
320 PRINT "Won ";WI;" out of ";NT;" tries."
330 PRINT "Winning percentage of ";P*100;"
    percent."

```

Carnival Game Simulation

In this game, you roll six balls and see which 'alley' each ball lands in. Alleys are numbered 1 to 6. Your score is determined by the alleys you land in: Alley #1

gives you 1 point, and so forth.
Any score >30 or <11 wins.

How many tries do you want (>1)? 100
Press RETURN to begin.?

Round #	Alleys					
1	1	3	2	1	6	3
2	1	5	6	6	4	1
3	3	1	6	6	5	2
4	6	1	6	5	3	2
5	2	3	6	4	5	2
6	6	2	3	4	2	1
7	4	5	4	3	3	1
8	2	5	3	2	2	6
9	3	3	2	5	1	3
10	5	1	6	4	3	3
↓	↓	↓	↓	↓	↓	↓
29	5	1	6	3	3	3
30	2	5	2	5	1	4
31	6	4	5	6	6	5
32	2	4	1	6	5	5
33	5	5	5	3	5	5
↓	↓	↓	↓	↓	↓	↓
94	2	3	5	6	5	2
95	6	4	1	2	5	2
96	3	5	5	3	2	5
97	5	4	1	5	6	1
98	6	6	3	1	3	1
99	2	5	3	3	5	1
100	4	1	1	2	3	1

Won 1 out of 100 tries.
Winning percentage of 1 percent.
Ready
>

Rehash on Rye

Some real beef amidst a lot of baloney

Digital Deli

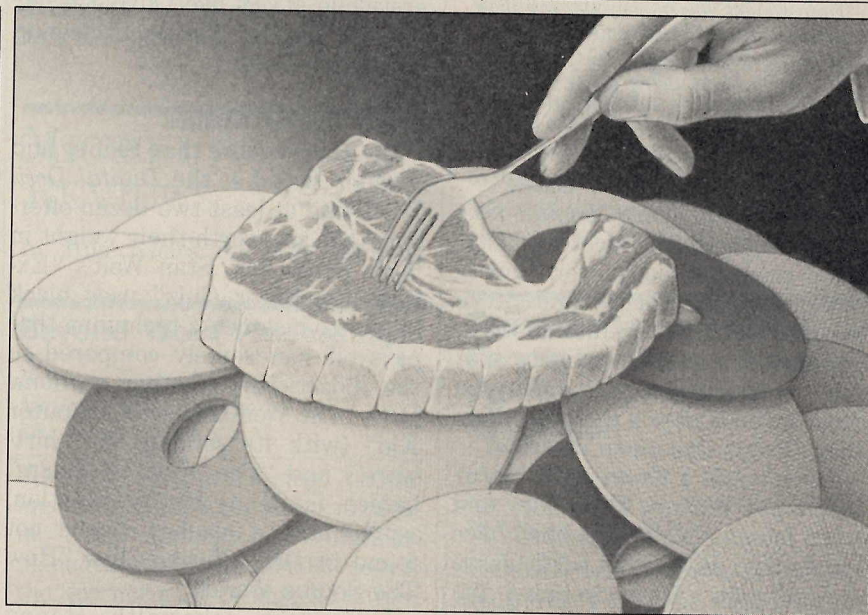
The Lunch Group & Guests
 Edited by Steve Ditlea
 Workman, New York
 382 pages, paper \$12.95
 Reviewed by Larry McClain

Digital Deli gets its name from The Lunch Group—a computer roundtable in New York City that began with five writers who held once-weekly repasts for the purpose of exchanging computer info. Although the quintet still forms the Group's nucleus, the entire cast and crew are now larger than *Dr. Zhivago*'s.

Digital Deli is a Herculean effort gone awry. It aspires to be a half-epic, half-pop sensation, yet it's plodding and ordinary. Far from being that bold departure from Every Computer Book You've Ever Read, *Digital Deli* buries its 10 percent of treasure amidst 90 percent snooze-worthy stuff. It was truly disappointing to discover how much of the book is simply a rehash of the worst clichés from computer magazines, circa 1981–82.

In my opinion, editor Steve Ditlea should be uttering a few *mea culpas* for sins like these:

- *Rehashing material from computer magazines:* if you *have* to rehash material from several years back, why not supply some fresh visuals or fresh angles? *Deli*'s guided tour of the Mormon Church's Salt Lake City database digs is just a dusted-off version (with some of the same photographs) of an almost 3-year-old magazine article. Like-



wise, *Deli* exhumes and recycles an old photo of Source-based poet David Hughes, to run alongside some of his previously published stanzas. Sheesh!

- *Hackneyed graphics:* I rather doubt that the book's art director was given a princely sum by Workman in the first place. (Loosening up the ol' art department purse strings is a *genuine* New Age idea, unlike potty-training one's cat using microcomputers, an item found on page 126 of *Deli*.) But what's the point of enlisting brilliant New York illustrator Rick Meyerowitz (he who got famous for eye-frying maps and illos in *National Lampoon*) if said artist can't use color?

To make matters worse, *Digital*

Deli is crammed with visuals so ridiculous as to be quasi-camp. Throughout this book we're treated to boring shots of couples cooing over their telebanking system or couples cooing next to some micro at a tropical computer camp.

- *Tackling topics even the magazines won't touch anymore:* in a sense, you can't fault the art director when the book is such a showcase for *au courant* topics like computer kids, computer camps, whither Logo, and short biographies of Babage and his beloved Ada. But my favorite "when-in-doubt-just-recycle-something" section was the one en-

Larry McClain is editor of *Architectural & Engineering Systems* magazine in Southern California.

titled "The ABC's of Word Processing," which matches a capital letter, Mister Rogers-style, with various definitions from the W.P. lexicon, i.e., "D is for documentation . . ." Actually, D is for "déjà vu" because we've certainly been here before.

• *Leads that drop like anchors:* I realize full well that you can't judge the lead sentence of a computer article by the same yardstick for leads seen in *The Atlantic*. Nevertheless, some of *Digital Deli's* leads need to be eradicated from our solar system—pronto. Try these on for size:

"Ever wonder how a computer can play a game of chess? Think about it." (Like hell I'm going to think about it!)

"The Levines were among the first on their block to have a home computer." (Who gives a hoot?)

Deli Plays "The Name Game"

Whatever its debits, *Digital Deli* is without doubt the most celebrity-laden computer book ever. Robert Moog, Timothy Leary, and Steve Wozniak all turn in creditable work, although it's highly unlikely that their contributions will make you drop the book as you exclaim, "Mon Dieu, Proust has been dwarfed!"

But it's still a damn sight better than what William F. Buckley and Atari founder Nolan Bushnell have coughed up. Buckley in particular is a royal pain. After dropping the name of his dear, dear associate George Will, the Wicked Wasp confides that, "I have recently subscribed to an electronic communications system, Telenet, that gives you a password." (Gee, Bill, out in Los Angeles us mere mortals simply dial 689-9040 to latch hold of Telenet; it's the online service at the other end that usually requires a password . . .)

Toward the end of his article, Buckley opines that "enough people by now know what a word processor does to make unnecessary the recounting of its versatility." That's right, Mr. Buckley, tell us something we don't already know.

When the frazzled reader finally stumbles onto something in *Digital Deli* that contains what journalists sometimes call a "peg" and radio-

execs call a "hook"—namely, something that nabs your attention immediately—it's like finding an oasis that's off-limits to Old Right columnists. Teresa Carpenter's article about software authors' anthropomorphic obsessions has a marvelous peg. So does Doug Garr's tribute to the horn-rimmed boys of summer who use computers to play and analyze baseball. In fact, the accompanying "Hardware/Software Trading Cards" cooked up by Garr and friends are hilarious. Every (computer-crazed) boy secretly yearns for trading cards with mug shots of erstwhile MVPs like Clive Sinclair and the Digital Research cleanup man, Gary Kildall.

Deli's Tastier Noshes

Yes, there's more than Skippy and Wonder Bread at the *Digital Deli*. You'll find at least two dozen offerings that are worth their weight in Nova Scotia lox. Stan Weit's "Extinct Computer Quiz" uses black humor to instruct, a technique that pays off handsomely compared to the didacticism of other sections. Both "The Well-Dressed Computer Kid" (with its send-up of "shirtware") and "The 10111'rd Psalm" (which is 23 in binary notation, natch) have a low-key charm not found in *Deli* offerings like "How The Source Works."

Legendary jokesmith Henny Youngman was somehow persuaded to chip in a sidebar. His computer-joke section kicks off with some killer material which quickly degenerates into one-liners fit for the Manhasset, Long Island Dial-A-Joke. Editor Ditlea is still to be commended, though, for adding Henny to the talent roster.

Most of the book's first-person accounts of boy-meets-hardware are surprisingly fresh and non-nerdy. I especially enjoyed "Test Driving The Epson QX-10" by *Esquire* contributing editor Frank Rose. The author was even coaxed into posing as the quintessential computer nerd for *Deli's* roving camera. Rose's "hep hacker" looks like he's heading up-town to catch a Grandmaster Flash

concert. How ironic if the "Valdocs Look" were to sweep the nation!

Ultimately, *Digital Deli's* quiet, non-epic revelations are its best, from Randall Rothenberg's candid assessment of the joys of CP/M ("copying files with the PIP command is a plain old pain in the butt") to straightforward tutorials on the basics of word processors and spreadsheets penned, respectively, by ace programmer Paul Lutus and Visicalc sire Bob Frankston. Yes, there's real beef amidst the baloney in *Digital Deli*, but this reviewer still feels flim-flammed. □

Legal Care for Your Software

Daniel Remer
Nolo Press, Berkeley, CA, 2nd edition
1984, 278 pages, paper \$24.95

A Software Law Primer

Frederic William Neitzke
Van Nostrand Reinhold, New York, 1984
157 pages, cloth \$24.95

Reviewed by Roy Katz

"When old laws meet new needs," says attorney Daniel Remer in *Legal Care for Your Software*, "ambiguities crop up," which is why programmers and software entrepreneurs should have a solid understanding of software law. An excellent place to obtain this is with a thorough reading of both Remer's book and Frederic Neitzke's *A Software Law Primer*. Both authors are lawyers experienced in the area of intellectual property law, and each approaches the complexities of software law from a slightly different perspective.

Legal Care for Your Software is a clearly written, how-to guide for programmers and software entrepreneurs that focuses on the basics of how various legal methods and tools can be used to protect newly created software. Despite its title, Neitzke's *A Software Law Primer* deals with more sophisticated legal concepts. It is a highly detailed discussion of recent software cases and their implications for software developers and marketers. In addition, Neitzke's

book will be of interest to nontechnical executives involved with buying or selling software and with employer/employee relations involving ownership of programs.

In *Legal Care for Your Software*, Remer describes the differences among the types of legal protection available for software. Though some software can be patented, he explains, this is usually not the best way to protect your programs. Rather, trade-secret and copyright law usually offer the most effective and easiest methods of protection.

In discussing the use of trade-secret law to protect software, Remer maintains that programmers should never show their source codes or program listings to anyone—spouse, friend, or business partner—without having them sign a nondisclosure agreement form first. While this may seem like a drastic measure, Remer argues that in order for a program—or anything for that matter—to be protected by trade-secret law, you must be able to prove that you treated your program as a secret.

Legal Care for Your Software is filled with dozens of horror stories illustrating what can happen if you fail to properly protect your software. A valuable addition to the book is its extensive appendix, which has more than 25 ready-to-copy forms of nondisclosure agreements, assignment of copyrights, work-for-hire contracts for independent programmers, licensing agreements, and so on.

If *Legal Care for Your Software* is an introductory guide, then *A Software Law Primer* is more like a textbook for a college business-law course. A good professor, Neitzke takes time to explain the important points of intellectual property law with keen insight. He cites real examples of software cases with an eye to the practical applications of the law.

In what is perhaps the most important chapter in the book, "Legal Tips for the Software Entrepreneur," Neitzke presents some sound advice for would-be entrepreneurs.

Among his many recommendations is that programmers incorporate as soon as possible. He maintains that there are "too many potential liabilities to justify proceeding without a corporate shield." On choosing a good lawyer, Neitzke says, "find a lawyer you are comfortable with; as your business grows, you will need an outside sounding board."

If you are seriously interested in developing a good working knowledge of software law or improving communications with your lawyer, then both Daniel Remer's *Legal Care for Your Software* and Frederic Neitzke's *A Software Law Primer* are mandatory reading. □

MICRO REVIEWS

by Mike Nicita and Ron Petrusha

Beyond Word Processing

Bernard Conrad Cole
McGraw-Hill, New York, 1985
320 pages, paper \$12.95

"Beyond word processing," according to Cole, is "knowledge processing": the application of database management techniques not only to the text normally produced by word-processing programs but to the entire gamut of activities involved in writing—research, note-taking, outlining, and organizing. Cole's book, written for the professional writer, provides a useful though flawed survey of 20 new software packages with a varied range of capabilities. The author's product evaluations are well researched and well organized, but in the context of his persuasive state-of-the-art arguments, his comments on the CP/M and Unix text editors seem out of place. And Framework, a real state-of-the-art knowledge processor, is relegated to a single page of description. Yet, despite these minor qualifications, Cole's book is an eminently useful guide to a new generation of writing tools.

Database for the IBM PC

Sandra L. Emerson and
Marcy Darnovsky
Addison-Wesley, Reading, MA, 1984
311 pages, paper \$14.95

Given the current proliferation of packages, an introduction to the concept of database management seems far more important than a simple product comparison. The authors, recognizing this, thoroughly explore techniques of database management and methods of database design while concretely relating users' needs to the many varieties of available software. While the reviews of individual packages could have been sharper in their criticism (one package "does not provide *total* information management"), the wealth of information that the authors have assembled makes informed product comparison possible.

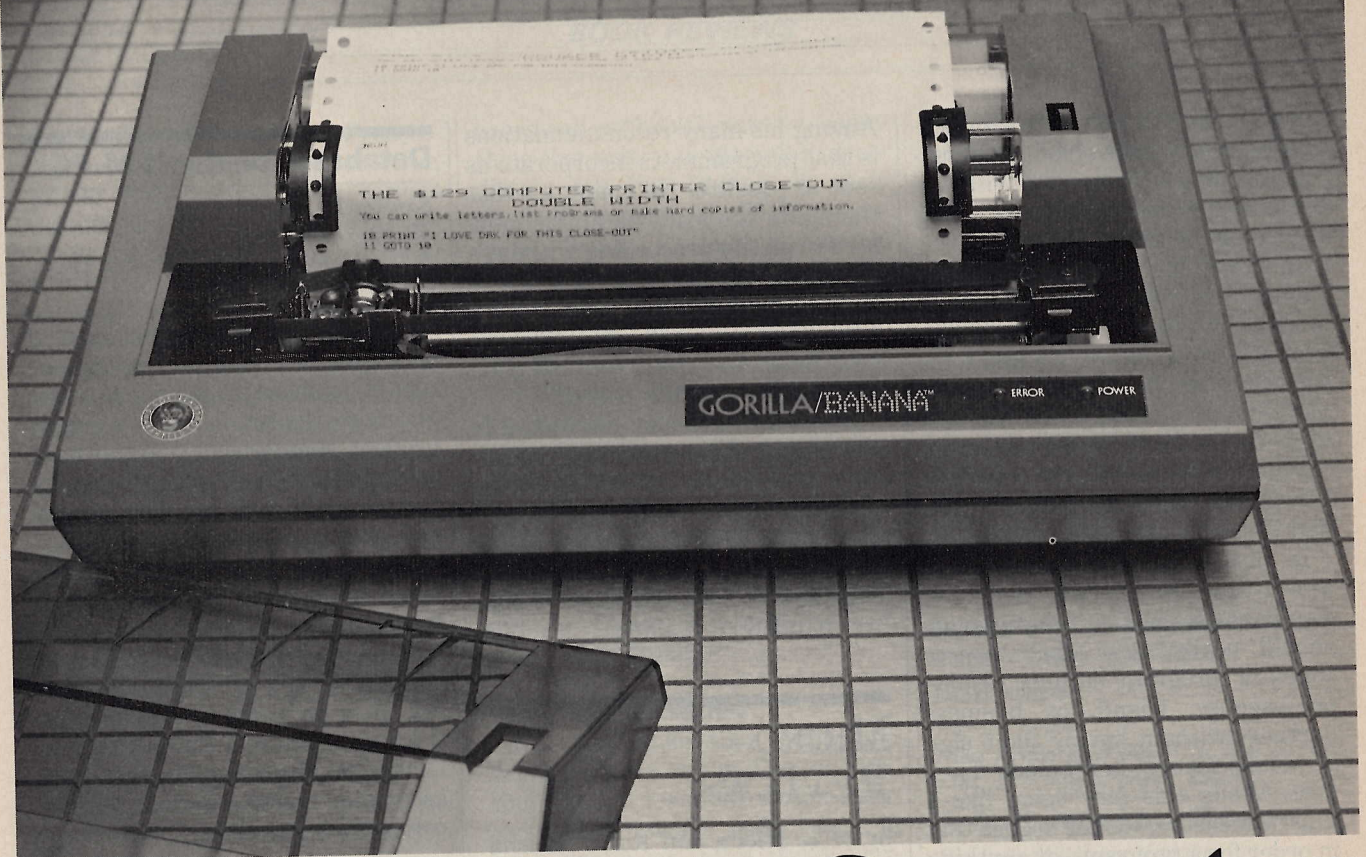
Tools for Thought: The People and Ideas Behind the Next Computer Revolution

Howard Rheingold
Simon & Schuster, New York, 1985
320 pages, cloth \$17.95

Technical trendsetters of the past and present and the author's picks for the future are this book's biographical subjects. Some of them are Charles Babbage, Alan Turing, John von Neumann, Norbert Weiner, J. C. R. Licklider, Robert Taylor, Alan Kay, and Avron Barr. Rheingold masterfully describes Lady Lovelace's obsessions with programming and gambling, the political infighting for credit for the first electronic computer, the excitement at Xerox's PARC labs in the early '70s, the hacker subculture at MIT, and current efforts to create the ultimate media room. This is a special book, one of the best histories yet of the new wave of sociological and psychological retrospectives on computers. □

Mike Nicita and Ron Petrusha are coauthors of *The Reader's Guide to Microcomputer Books*, 2nd ed. (Golden-Lee, 1984).

\$129 PRICE EXPLOSION



The Complete Computer

Here's a 50 character per second, plain paper, dot matrix printer that you can use with virtually any home or office personal computer. It's built really tough to withstand heavy use. It's really easy to use. And, it even prints graphics. Price Slashed to \$129.

By Drew Kaplan

Complete your computer. Now you can harness the full power of your computer. From writing letters to listing programs, your computer will be incredibly more useful.

It uses **plain paper** and it's super reliable. It prints both upper and lower case characters. And, if you aren't using a printer with your computer, read on.

LISTING/INDEXES/LETTERS AND MORE

Experience the thrill of actually writing your letters and reports on your computer. Now you'll be able to use all of your computer's word processing and **correcting** capabilities to really explore your creative talents.

It's easy. Some of the new word processing programs are so 'user friendly' that you can learn to use them in just about 10 minutes. Change a line, change a word, move a line. Just push a button.

Are data bases a four letter word? Not on your life. Now you can use your computer to organize all your telephone numbers, your stocks, stamps, and recipes.

If you're using your computer for business, you can have a complete, instantly accessible file for each customer by name, what they bought, when, etc.

A data base will let you find or organize and print out any information you want, however you want, whenever you want.

There's no more complicated programming required. And, inexpensive data base programs are available at any computer store.

PERMANENT RECORD

If you have a modem, you're in for a treat. You can access encyclopedias, stock market reports, and much more. When you sign on a service like CompuServe or The Source, the world is quite literally at your finger tips.

With a printer, you can get a 'hard copy' of all the incoming information. You can get everything from SAT test simulations and IQ tests to loan amortization schedules.

AFRAID OF PROGRAMMING?

You don't need to know the first thing about programming to use this or any printer. But, if you've never typed in and run a program, here's the easiest one I know. Turn on your computer.

Commodore Owners, and Atari Owners, your computer, and most others will say 'Ready'. Just push Control and Reset on an Apple. Then type the following:

**10 PRINT "DAK IS WONDERFUL"
20 GOTO 10
RUN**

You should type a carriage return at the end of each line. Why not try this program now? Next time, I'll tell you how to get out of the program, and maybe even discuss peeks and pokes.

If the program isn't running, type LPRINT instead of PRINT in line 10.

To you sophisticated programmers, think how easy your life will be when you can print out program lists that you can study at length.

And, you won't have to load a bunch of disks to find a program when you print out a menu for each of your disks.

LOOK AT ALL IT DOES

An ad in several August computer magazines listed a \$149 thermal printer (that needs expensive thermal paper) as the lowest priced printer in the U.S.

Imagine a 50 character per second, plain paper, full 80 column dot, matrix printer with a built-in standard Centronics Parallel Interface, slashed to just \$129.

This printer handles plain old cheap standard fanfold pin feed computer paper from 4.5" to 9.5" wide, with it's built-in adjustable tractor pin feed drive.

It's so powerful you can even use two-part forms for a carbon copy. Plus, there's an impact control for print darkness.

It understands and prints 116 upper and lower case characters, numerals and symbols. And that's not all.

You can even print Double Width characters. **And, look at this.** This printer has full graphic capabilities with 480 dot horizontal resolution and 63 dot per inch vertical resolution. So, you can print out your pictures, pie charts or graphs.

It prints 10 characters to the inch, six lines to the inch. In short, it's going to make typewriters into dinosaurs. When hooked to your computer, you'll never have to retype anything again. If you find an error, just make the correction and let the computer retype your work for you.

The printer is made by C. ITOH/Leading Edge in Japan. It's built to really take heavy use. But in the unlikely event that it should need service, there are approximately 400 service centers nation wide.

It takes standard long life inked ribbon cassettes that are readily available nation-wide. This is a printer that will give you many years of continuous reliable service and enjoyment.

AND NOW THE BAD NEWS

If you're the president of a large company sending important business letters, you may want a \$1000 daisy wheel printer. But for most uses, dot matrix printers are incredibly faster, and there isn't any way to print out a graph or picture on a daisy wheel printer.

But, there are two things you need to know about this printer. First, it has about the dumbest name I've ever seen. It's built tough and rugged. So, they named it The Gorilla Banana Printer.

Second, like many dot matrix printers, the letters g, j, p, q, and y are level with the other letters. Each letter is completely and perfectly formed, but each sits level with the rest of the alphabet.

Upper case letters and symbols are unaffected. So, if you don't want letters that look like they were printed by a computer, this printer isn't for you.

But for most letters, term papers or reports, programming and all the data bases and information you'll get through a modem, this printer is perfect.

COMPATIBLE COMPUTERS

Any Computer with a standard Centronics parallel port, such as: Apple, Franklin, IBM PC, TRS80, Osborn, Atari, Commodore VIC 20, Commodore 64, Kaypro, and virtually any other personal computer. Plus, most briefcase portables.

FEAR OF INTERFACES?

Your computer is smart. But, it doesn't know how to 'talk' to other devices. That's why you need an interface.

An interface isn't just a cable. It's actually an intelligent translator that lets your computer talk to other equipment.

Usually the computer manufacturers don't include the various interfaces when you buy your computer, because they don't know if you'll ever add peripherals such as disk drives, printers or modems.

So, rather than sell you something you don't need, you don't buy an interface until you add onto your computer.

There are two types of printer interfaces. The first allows you to do text word processing. For 99% of computer use, this is all that is needed. It translates all the possible letters and punctuation known as ASCII. This printer understands 116 characters and symbols.

A second type of interface also allows you to dump pictures or graphics from your screen or memory. This is more complicated because every dot must be told where to go. This interface, or 'driver program' as it is called, is available in two forms; built into an interface card, or as a program on a disk which you use in

conjunction with any standard interface.

Either way, you'll have the printer operating in just a few minutes. And if you already have a printer, the same Centronics parallel interface and cable (about 85% of all printers are compatible) should work with this printer.



With this printer you can alter your graphics as you desire. You can print normal or reversed (both shown above, reduced to fit in this catalog) and you can even print double size.

WHY SO CHEAP

A new model will emerge soon with a different name. Leading Edge had just 28,000 of these remarkable printers which have been selling at discount for as little as \$199, left in stock.

DAK bought them all for cold hard cash. And now we're offering them to you for less than the original price we were quoted as wholesale.

The printer is approximately 16½" wide, 9" deep and 7" tall. It's backed by Leading Edge's standard limited warranty.

ADD PRINTING POWER TO YOUR COMPUTER RISK FREE

Now you can really make use of your computer. 50 characters per second printing on plain paper for just \$129. Wow!

Now you can print out your programs, your notes or your letters. If you're not 100% satisfied, simply return the printer and any accessories in their original boxes to DAK within 30 days for a refund.

To order your 50 Character Per Second Dot Matrix, Plain Paper Printer with a built-in Centronics Parallel Interface, risk free with your credit card, call toll free, or send your check for the breakthrough close-out price of just \$129 plus \$8 for postage and handling to DAK. Order No. 4101. CA res add 6% sales tax.

Special Note: If you need a serial printer for a computer, such as the TRS80 Color Computer, order the identical printer with a built-in Serial Interface for the same price. Use Order No. 4102.

The Printer comes packaged with a long life ribbon. Extra ribbons are available at computer stores. DAK has them for \$4 each (\$1 P&H) Order No. 4103.

Standard Centronics Interfaces for your computer are available at any computer store. This Printer has its receiving inter-

face built in. You simply need one, complete with its cable, to plug into your computer 'to send' information. Below are our favorites for 5 of the most popular computers.

For your Apple. We have Practical Peripherals' text interface for just \$49 (\$2 P&H) Order No. 9877. We have their graphics capable interface for just \$79 (\$2 P&H) Order No. 4104. If you already have a Centronics Parallel Interface, we have a graphics driver program on disk for just \$7 (\$1 P&H) Order No. 4105.

For your IBM PC, you don't need an interface. It's usually already built-in. But, you do need a cable. We have a cable, ready to connect this printer to your computer, for just \$19 (\$2 P&H) Order No. 9879. We have a graphics driver program on disk for just \$7 (\$1 P&H) Order No. 4106.

For your Atari 800, 800XL, 400, or 600XL, we have a text interface for just \$69 (\$2 P&H) Order No. 9881. We have a graphics driver program on disk for just \$7 (\$1 P&H) Order No. 4107.

For your Commodore VIC 20 or 64, we have a text interface for just \$39 (\$2 P&H) Order No. 9883. We have a Graphics Interface for just \$54 (\$2 P&H) Order No. 4108.

Special Bonus for Commodore 64 owners. We have a powerful word processing program with editing, including changing a line, a word, or moving a line. Once you've tried computer word processing, you'll never want to look at a typewriter again.

Plus, we have a super data base program that lets you use 8 fields of information on up to 200 subjects at a time. Then you can search for any part, sort alphabetically or numerically and print out an address book, a list of your stocks or anything you can imagine. They're both yours for just \$5 (\$1 P&H) with purchase of the printer. Use Order No. 4122 for Disk, or Order No. 4123 for Cassette.

For most TRS80 Computers, you don't need an interface, just a cable. For the Black and White Computers, we have a Parallel Cable for just \$18 (\$2 P&H) Order No. 9885. For the Color Computers we have a Serial Cable (you need the Serial Printer as well) for just \$18 (\$2 P&H) Order No. 4109.

For briefcase-type portables, the Centronics Interface is usually built-in. Just stop by any computer store. All Centronics Printers use the same cable at the printer end, but you'll need a cable that fits your particular computer's plug.

Get hard copy print-outs of your programs or your graphics. Turn your computer into a powerful word processor. Forget retyping ever again. For just \$129 you can make your computer complete.

Apple, Atari, IBM PC, Franklin, Commodore VIC 20 & 64, TRS80, Osborn, and Kaypro, are registered trademarks of Apple Computer, Atari Inc., International Business Machine Corp., Franklin Computer, Commodore Electronics Ltd., Radio Shack/Tandy, Osborn Corp. and Kaypro respectively.



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Substituting short, efficient assembly-language programs for BASIC subroutines speeds up many operations.

of instruction, we can store the numbers at addresses determined by the values in register B rather than writing a separate instruction for each location (for example, STA 01, STA 02, and so on). In this way, we can use a register just as we would use a variable in BASIC.

However, we want the program to print the numbers in a row across the screen, not all at the same location. To do that we use the INCB instruction (Increment B)

Hexadecimal Numbers: Shorthand for Binary

For simplicity's sake, we expressed the instruction codes for our primer computer as ordinary decimal numbers. Normally, however, these codes are expressed in hexadecimal (base-16) form. When you look at listings of assembly-language programs, for instance, you'll see the memory addresses and machine-language instructions written as hexadecimal numbers to the left of the source code.

Why do we use hexadecimal numbers if the computer can manipulate only binary numbers? If you were to start writing a program in binary code, the problem would quickly become clear: binary numbers are lengthy and awkward—long strings of 1s and 0s. Working with them is so tedious that it's easy to make mistakes when writing and typing them. Hexadecimal numbers use fewer characters to represent large numbers.

The hexadecimal system uses the decimal numbers 0 to 9 to represent the numbers 0 to 9. However, it uses A, B, C, D, E, and F to represent 10, 11, 12, 13, 14, and 15, respectively. The hexadecimal number for the decimal 170 is expressed as AA, where each column in the number represents a power of 16:

Decimal	4096	256	16	1
Hexadecimal	0	0	A	A

$$160 + 10 = 170.$$

Binary and hexadecimal numbers are directly related: four binary digits equal one hexadecimal digit. Each byte, then, can be expressed as two digits rather than eight. Many assembly-language programming manuals contain charts and formulas you can use for easy conversion of numbers from decimal to hexadecimal to binary equivalents.

at address 16006, which adds 1 to the location stored in register B.

Next, we want to increase the contents of register A by 1 to get the next number to be displayed. So we use the INCA instruction. We could also use the add (AD) instruction to add 1 to register A, but that would require two bytes. Using INCA is faster, shorter, and more convenient.

But remember that we want to display only the numbers from 1 to 9. To do that we need to set up a test

that will tell the program when to stop. We use the CMPA instruction, which compares the value of the data in register A with the operand 58. The ASCII value 58 is 1 greater than the value for the number 9 (57). We use 58 instead of 57 because we increment the value in register A before we test it. If we compared the value in register A to 57, the program would end before it displayed a 9 on the screen.

The CMP and BNE instructions are very important in assembly-language programming: they enable a program to test for conditions and make decisions based on the results of the test. The CMP instruction is called a test instruction, and the BNE instruction is called a conditional branch instruction.

After the program performs the test, we want it to loop back and get the next number to be displayed and the next screen location. We use the BNE instruction at 16010, which branches back to execute the third instruction again if the values in the previous instruction were not equal. If the values are equal, the program has reached the number 9 and continues sequentially to the next instruction in memory. The LOOP address is the operand after the BNE instruction.

Finally the RTN instruction finishes our program. It returns us to the operating system or BASIC, depending on how we began the program's execution.

Notice that the program has no line numbers like BASIC programs do but uses addresses instead. For our primer computer, we must reserve space ourselves for the instruction codes and place them in successive memory addresses one by one.

Running BASIC and Assembly Together

By itself, our sample program doesn't accomplish much. But suppose we want to substitute this short, speedy program for a similar BASIC subroutine within a larger BASIC program. We could use standard BASIC commands to run the two programs together. To illustrate the process on our primer computer, we'll use several familiar BASIC commands (these commands and their formats vary for different computers).

We must first place the assembly-language program in user memory. On our primer computer this area extends from location 16001 to 65536. By using BASIC's POKE command, we place each of the 12 opcodes and operands in successive memory locations: POKE 16001,43; POKE 16002,49; and so on. Alternatively,

we can use BASIC's READ and DATA statements along with the POKE command to load the assembly-language program into memory automatically:

```
10 FOR A = 16001 TO 16012
20 READ C
30 POKE A,C
40 NEXT A
50 END
60 DATA 43, 49, 46, 01, 53, 66, 63, 45,
58, 70, 16005, 80
```

In line 10, the variable A is set equal to 12 successive memory locations where the instruction codes for our program will be stored. In line 20, READ C pulls up code numbers one at a time from the data in line 60. Line 30 stores the code numbers for our assembly program in the proper memory locations. (If we actually ran this assembly program with BASIC, we'd first have to reserve memory space for the program to prevent BASIC from using the same memory locations.)

After loading the program with BASIC, we can also run the program when we need it by giving the proper BASIC commands. We tell BASIC the memory location where the program starts with the USR command, in a form such as DEF USR=16001. We execute that statement with another command, say, X=USR(0). BASIC will then let the microprocessor execute the assembly commands directly; when it's finished with the operation, the microprocessor returns to the BASIC program.

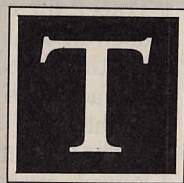
Normally, when assembly-language programmers need a unique operation performed with speed, they call up an assembly-language routine with a USR or CALL command. Most computers have these special commands that you can use when necessary; your computer's programming manual will have the details.

Forging Ahead

When you explore assembly language further, you'll see a number of terms that we haven't mentioned because we've been illustrating basic concepts with our primer computer's simplified microprocessor. Instead of two registers, for example, most microprocessors have six or more registers, both general- and special-purpose.

We've already seen the importance of the A register, or accumulator, where arithmetic operations are carried out. Our primer computer also has a B register, a general-purpose storage area. Most microprocessors have several general-purpose registers, and all have an instruction register, an area that stores the current instruction, finds out how many bytes the operand occupies, sets a program counter, and performs other functions.

The program counter is a special-purpose register that stores the address of the next instruction to be fetched from memory. Once that instruction has been loaded into the instruction register, the program counter is incremented—it automatically stores the address of the next instruction in the sequence. However, certain instruc-



*to exploit the power of
assembly language, you'll
need the memory map, mnemonics,
and opcodes for your computer.*

tions, such as BNE, enable the program counter to skip to another memory location instead of executing the program in its normal sequence.

Another frequently found register is the flag or condition-code register. Individual bits, which act as markers or flags, store 1s and 0s that tell you the results of operations (such as a CMP instruction). They indicate, for instance, if the result of an operation was positive, negative, a carry (an overflow), or zero.

A third special-purpose register is the stack pointer. A stack is a portion of memory that provides an easy way to temporarily store data, instructions, and addresses currently in registers. For instance, you might want a program to temporarily stop its normal operation, execute a special subroutine, and then return to the place where it left off. To do that you use the stack-pointer register to indicate the address of the stack in memory, along with two instructions that let you move the contents of the registers in and out of the stack.

The PUSH instruction tells the microprocessor to move the contents of all registers into the stack on a first-in, last-out sequence—similar to the way a pile of cafeteria trays is stacked. When you want the program to continue where it left off, you use a PULL instruction, which retrieves the data from the stack, loads it into the proper registers, gets the address of the next command in memory from the program counter, and continues from where the interrupt occurred.

By exploiting these and other capabilities of your microprocessor, you can make some very handy things happen. On some models, you can produce new function keys, run programs at twice the normal speed, install security codes in your programs, and more. You can also add new functions to your operating system or BASIC with your own utility programs. To do all these things, you'll need the memory map, mnemonics, and machine-language codes for your particular computer, which you'll find in computer-specific assembly-language programming books.

This month, our primer computer with its simplified microprocessor and memory helped us visualize the fundamentals of assembly language. Next month, leaving our hypothetical computer behind, we'll forge ahead to the real world of assembly-language programs for Apple IIs, IBM PCs, and TRS-80 Model Is, IIIs, and 4s. We'll also offer guidelines for writing programs and for selecting an assembler program. □

INVASION OF THE MOVITS

CONTINUED FROM PAGE 87

The Invasion Progresses

The personalities of the other Movits grew on me in other ways. Take Peppy, an orange roustabout with a long proboscis in front that responds to sound and touch. When provoked, he backs up in a quarter circle, scoots off in a new direction, and never stops. Peppy is hyperkinetic and demands enormous attention. He's always falling off tables or running under sofas or hitting some object and spinning his wheels.

One day I made the mistake of blowing the whistle while both Peppy and the Piper Mouse were on. Chaos ensued. The robots dashed off in different directions, and, panicking, I resorted to the only method I knew to manipulate them: blowing the whistle again. They then got completely out of hand. For a moment, I experienced the awful feeling of the solution becoming part of the problem. Then Peppy fell off the coffee table onto a beanbag chair, and the crisis ended. I turned him off and set him gently back on the table.

I discovered a different aspect of Peppy's character one day when my wife accidentally tipped him on his rear while he was moving.

He remained in motion, spinning in place with his proboscis sticking straight up in the air. It was a weird, self-abasing posture, as though he were atoning for his many sins. I found it oddly poignant, and it almost made me forgive the little incorrigible.

Another Movit, Mr. Bootsman, proved to be a reliable crowd-pleaser. This personable robot walks along on six legs and looks like a very strange pet on a leash. You control Mr. Bootsman's speed and direction with a box wired to it. On low speed, he moves like a dignified caterpillar; on high, all dignity disappears and he scurries like a spider toward dinner. On high, he seems to be trying to catch up with something. I took Mr. Bootsman out for a walk, and local dog owners were not amused.

The Line Tracer II and the Memocon Crawler shed a little different light on how these robots were worming their way into my life. Both resemble useful robots. The Line

Tracer, for instance, is a scaled-down version of robots used in Japan to carry messages. You lay out a track for the Tracer by putting down black tape on a white surface. The robot then barrels down the line, yawing slightly left and right as it adjusts for the course.

The Tracer's obedient way of following black lines inspired, even demanded, a little experiment. I set the robot down on the main stem of a large black Y and turned it on. What would happen at the fork? Put a compulsive human in that kind of situation and you can create severe stress. The Line Tracer, however, simply became confused, wandered off course, and commenced counterclockwise circles. The behavior was like that of a computer stymied by an illogical situation—it was unhumanlike and somehow disappointing.

The Memocon Crawler, a broad shallow dome that jets around on wheels, is interesting technically because it is programmable. You type in instructions on the little keyboard that comes with the Crawler or hook it up to the parallel port of a computer and program it. You can command it to issue a beep or flash its headlight.

But programmability somehow violates the Movit spirit. The Crawler and the Line Tracer lack the spunky spontaneity of their fellow robots. Movits generally combine responsiveness to the environment with a sense of independence. The Crawler and Line Tracer, however, are controlled much too easily and too far in advance.

Takeover Complete

Why are these Movits so infectious? How had they managed to take over my house? The answers are many. They move in unforgettable ways. They are intelligent. They react to the world, yet seem to want autonomy. They are distinct from each other. They ultimately look appealing, like robust little aliens. They are controllable, yet, generally, not too controllable. They are oddly like people—not so much real people as characters in shows like *The Honeymooners*.

And there is probably more. It doesn't matter to me. They have conquered my home, and I've surrendered peacefully. □

A MOVIT'S DOME

Most Movits work in a relatively straightforward manner. To turn them on, you start their motors; sensory input stops them or starts them up again. When you switch on the Avoider, for instance, two motors start. One controls feet on the right side, the other feet on the left. The robot also begins emitting an infrared beam. When an object gets close enough, the Avoider's sensor detects the reflection of the beam. This input causes the Avoider to shut off the motor on one side, so that the other turns the robot in place. It swings around until the infrared beam is no longer detected, then both motors start working, and it lurches forward again.

Other Movits are available. The Navius is a twin-domed robot that you can program by darkening blank spaces on a paper disk. The Medusa is a relatively tall quadruped modeled after a creature in *Star Wars*. The Monkey has two arms and swings hand over hand down a wire like a gibbon. More Movits are about to be introduced, including a programmable one with antennas that backs up when it strikes something and commences the program anew.

Movits are designed and built in Japan and distributed in the United States by OWI Inc., 1160 Mahalo Place, Compton, CA 90220. They cost between \$25 and \$75 and come in kits, which may require several hours to assemble. The company promotes them as educational devices for learning robotics. For names of local retailers, contact OWI at 213-638-4732.

Playback

Test and train your powers of memory

by George Stewart

Most people can easily remember numbers with up to seven digits—think of the telephone numbers you can recall without difficulty. With this month's program you can test your mental mettle to the limit. The program challenges your ability to memorize and repeat an ever-lengthening sequence of random digits the computer generates—as many as 64 or more in a sequence.

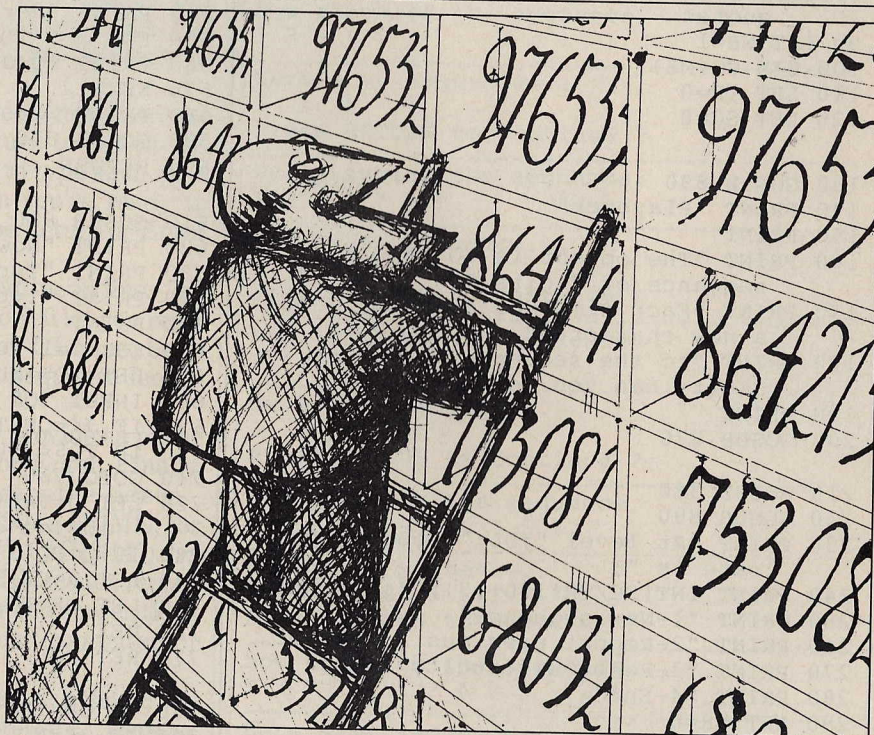
The program starts with a difficulty level of 7. If you successfully play back a 7-digit sequence, the computer will commend you and start a new sequence. You can raise or lower the difficulty level to suit your ability after each round.

The BASIC Program

Playback is written in Microsoft BASIC and should run without modification on most personal computers. Where language differences might cause problems we offer alternate lines for various computers. Type them in only if you cannot use the primary lines. Look up any unfamiliar BASIC words in your computer reference manual.

The program listing is shown on page 154. Type in each block of lines as you read along, and check your work carefully against the printed listing.

The first block, lines 10 to 120, sets up the program parameters and constants. If your computer has the RANDOMIZE statement, use it in place of lines 10 and 20. Line 30 sets the maximum sequence length to 64 digits. If your computer has sufficient memory and you're up to the challenge, you can increase the limit to 255 or possibly even higher. Line 40 sets the range



of digits from 1 to 9. Line 50 sets the difficulty level to 7; you can change it after playing the first round. The array CQ () stores each digit of the current sequence.

Lines 130 to 200 print the playing instructions. The subroutine called in line 130 clears the screen, and the subroutine called in line 200 pauses until you press Return or Enter.

Lines 210 to 370 play the first round and print the continuation menu. The subroutine called in line 210 starts a round, and lines 230 and 240 show your success rate as a percentage. Lines 250 to 370 provide a menu with four options: start a new sequence, repeat the previous sequence, reset the difficulty level, and end.

George Stewart is a contributing editor of *Popular Computing* and author of *The Apple Program Factory* and *The C-64 Program Factory* (Osborne/McGraw-Hill, 1984). Program Factory is a trademark of the author.

The Subroutines

The rest of the program consists of subroutines. The subroutine in lines 380 to 520 plays a single round. In line 380 the sequence pointer CP indicates the current number of digits in the sequence; for new sequences CP=0.

Line 390 increases the pointer by 1, and line 400 ran-

domly selects the next digit for the sequence. After line 400, C should be a whole number from 1 to NC (9). For IBM PCs and certain other computers change RND(1) to RND in line 400. Look up random numbers in your BASIC reference manual if you have problems with this line.

When you choose the second menu option (to repeat

```

10 INPUT "ENTER A RANDOM NUMBER ";X
20 X=RND(-ABS(X))
30 LET MS=64
40 LET NC=9
50 LET DL=7
60 LET NO=0
70 LET YES=1
80 LET NUS$="": REM No space inside the
  quotes
90 LET NR=1
100 DIM CQ(MS)
110 LET TR=0
120 LET SC=0

130 GOSUB 890
140 PRINT "Playback"
150 PRINT
160 PRINT "The object is to repeat a
  sequence of digits."
170 PRINT "Each time you succeed, I add
  a new character"
180 PRINT "to the sequence. How many
  digits can you remember?"
190 PRINT
200 GOSUB 870

210 GOSUB 380
220 GOSUB 890
230 PRINT "At level ";DL;" your success
  rate is ";
240 PRINT INT(SC/TR*100+.5); " percent."
250 PRINT "1-New sequence"
260 PRINT "2-Repeat previous sequence"
270 PRINT "3-Reset difficulty level"
280 PRINT "4-End"
290 LET NR=0
300 INPUT "Select 1-4 ";NR
310 IF NR<1 OR NR>4 THEN 220
320 IF NR=4 THEN END
330 IF NR<3 THEN 360
340 GOSUB 810
350 GOTO 110
360 ON NR GOSUB 380,420
370 GOTO 220

380 LET CP=0
390 LET CP=CP+1
400 LET C=INT(RND(1)*NC)+1
410 LET CQ(CP)=C
420 GOSUB 530
430 LET OK=YES
440 GOSUB 610
450 IF OK=NO THEN 480
460 IF CP=DL THEN 480

```

```

470 GOTO 390
480 GOSUB 780
490 GOSUB 870
500 LET TR=TR+1
510 IF OK=YES THEN LET SC=SC+1
520 RETURN

530 GOSUB 890
540 PRINT "Here's my sequence..."
550 FOR J=1 TO CP
560 PRINT CQ(J);
570 NEXT J
580 PRINT
590 GOSUB 870
600 RETURN

610 GOSUB 890
620 PRINT "Now playback the sequence."
630 PRINT "Type one digit per line."
640 PRINT "Type an empty line to end."
650 PRINT
660 FOR J=1 TO CP+1
670 LET TQ$=NUS$
680 INPUT TQ$
690 IF J<=CP THEN 720
700 IF TQ$<>NUS$ THEN 750
710 GOTO 760
720 LET Q=VAL(TQ$+" "); REM 1 space
  inside quotes
730 IF Q=CQ(J) THEN 760
740 LET J=CP+1
750 LET OK=NO
760 NEXT J
770 RETURN

780 IF OK=YES THEN PRINT "You did it!"
790 IF OK=NO THEN PRINT "Error"
800 RETURN

810 PRINT "Reset difficulty level"
820 PRINT "Current level is ";DL
830 PRINT "Enter new value
  (0<level<";MS;"")"
840 INPUT DL
850 IF DL<1 OR DL>MS THEN 830
860 RETURN

870 INPUT "Press RETURN to continue
  ";ENS$
880 RETURN

890 CLS
900 PRINT:PRINT:PRINT:PRINT:PRINT
910 RETURN

```


the previous sequence), the computer starts at line 410, leaving CP at its most recent position. The subroutine called in line 420 shows the current sequence, and the subroutine called in line 440 lets you try to repeat it. In line 450, OK=NO indicates that you've made an error. In line 460, CP=DL indicates the sequence is at its maximum length, determined by the difficulty level DL.

If OK=NO, lines 480 to 520 report the results of the completed round, update the counter TR that keeps track of the number of tries, and return to the menu so you can repeat the previous sequence of digits. If CP=DL, lines 480 to 520 report the results of the round, update the counter SC that keeps track of the number of successful tries, and return to the menu so you can try a new sequence.

On the other hand, if you've made no mistakes and the sequence hasn't reached the maximum length, the program jumps back to line 390 to add another digit to the sequence.

Lines 530 to 600 show the current sequence. The next block, lines 610 to 770, gives you a turn to repeat the sequence. The program prompts you to type each digit of the sequence, one per line. When you're ready to signal the end of the sequence, you type Return or Enter on an empty line.

After the end of a round, the subroutine in lines 780 to 800 reports the results. Lines 810 to 860 let you reset the difficulty level. The difficulty level DL must be in the range of 1 to MS (the maximum sequence length that you set in line 30).

The subroutine in lines 870 and 880 provides a pause in the action until you press Return or Enter. Finally, the subroutine in lines 890 to 910 clears the screen.

For Apple IIs change CLS in line 890 to HOME; for Commodore 64s change CLS to PRINT CHR\$(147). On many other computers, use PRINT CHR\$(code), replacing code with the control code to clear the screen (look up video-display control codes in your computer or BASIC reference manual).

Line 900 moves the cursor a few lines down the screen so the messages are easier to read. Increase or decrease the number of PRINT commands as needed to suit your screen format.

Using the Program

A sample run of the program appears on the right. You should get similar results on your computer. We've used a standard difficulty level of 7 and modified the format slightly to conserve space. □

A disk containing more than 25 ready-to-run projects (some never published in this magazine) is available for Apple, Atari 800, Commodore 64, IBM, Texas Instruments TI 99/4A, and TRS-80 computers.

For complete details, write to George Stewart, The Program Factory on Disk, POB 137, Hancock, NH 03449.

Playback

The object is to repeat a sequence of digits. Each time you succeed, I add a new character to the sequence. How many digits can you remember?

Press RETURN to continue ?

Here's my sequence...

3

Press RETURN to continue ?

Now playback the sequence.

? 3 ?

Here's my sequence...

3 1

Press RETURN to continue ?

Now playback the sequence.

? 3 ? 1 ?

Here's my sequence...

3 1 5

Press RETURN to continue ?

Now playback the sequence.

? 3 ? 1 ? 5 ?

Here's my sequence...

3 1 5 6

Press RETURN to continue ?

Now playback the sequence.

? 3 ? 1 ? 5 ? 6 ?

Here's my sequence...

3 1 5 6 5

Press RETURN to continue ?

Now playback the sequence.

? 3 ? 1 ? 5 ? 6 ? 5 ?

Here's my sequence...

3 1 5 6 5 2

Press RETURN to continue ?

Now playback the sequence.

? 3 ? 1 ? 5 ? 6 ? 5 ? 2 ?

Here's my sequence...

3 1 5 6 5 2 8

Press RETURN to continue ?

Now playback the sequence.

? 3 ? 1 ? 5 ? 6 ? 5 ? 2 ? 8 ?

You did it!

Press RETURN to continue ?

At level 7 your success rate is 100 percent.

- 1-New sequence
- 2-Repeat previous sequence
- 3-Reset difficulty level
- 4-End

This sample run shows a slightly modified format.

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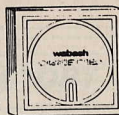
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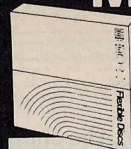
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ASK POPULAR

What is the difference between an RS-232 interface and an RS-232C? If hardware has the RS-232C interface, will it work with any computer that has the same one? Eric Rhodes
Long Beach, CA

RS-232 is a standard established by the Electronic Industries Association (EIA) to "interface between data terminal equipment and data communication equipment employing serial binary data interchange." The latest update of this standard in August 1969 was called revision C. Hence, RS-232C simply refers to the current revision.

The standard defines four general areas: the voltage levels of the ones and zeros that make up the data; the shape of the connector and the assignment of the various signals to the pins; the control, data, and timing signals used in digital interfaces; and standard subsets of signals for specific interfaces.

Although two pieces of hardware can be interfaced if they have RS-232C connectors, there is no standard connecting cable. To avoid problems, ask your dealer for the correct cable for your particular equipment combination.

A copy of EIA Standard RS-232C is available from the Electronic Industries Association, Engineering Department, 2001 Eye St., N.W., Washington, D.C. 20006; (202) 457-4900.

Can you please explain computer video displays, from the keyboard stroke to the image on the screen? Can the number of lines and number of characters per line be changed? How is this related to the pixel count, and how much memory is required for pixel storage? Fred Auchenpaugh
Ballston Spa, NY

Two display-generation methods are used in most microcomputers: character-based and bit-mapped. The character-based display is the less expensive and easier to use.

A character-based system contains a ROM (read-only memory) that stores the patterns for the numbers and letters. Its operation can be compared to that of a piano: as each key is pressed, a unique note is generated. On the computer, pressing each key generates a unique code, usually ASCII (American Standard Code for Information Interchange). This code is sent to the ROM, and its output is a unique pattern of dots representing the desired character. This dot pattern is sent to the video-processing circuitry of the computer, which displays it on the screen at the proper row and column. The character is "drawn" one dot row at a time as the cathode-ray tube (CRT) sweeps its electron beam across the screen.

To keep the image on the screen, the character information is stored in the computer's memory and repeatedly scanned. Each keypress generates one ASCII code for one character, requiring one memory location, or byte. A 25-line display with 80 characters per line requires 25×80 or 2000 bytes of memory, roughly 2K.

Each dot in the display is called a picture element, or pixel. A typical character is defined by a cluster of 7 horizontal dots by 9 vertical dots. The characters are formed by lighting various dots in this matrix. If one blank dot is used to space each character, you need 8 horizontal dots, or pixels; an 80-character line requires 80×8 , or 640 pixels. Vertically, 10 dots are used for each line (9 plus the one blank dot), so 25 lines requires 250 pixels.

A bit-mapped display controls every pixel on the screen. This method offers a greater range of shapes, and bit-mapping is used for high-resolution graphics. An area of memory is dedicated to the screen, and writing a byte into a screen memory location will "light" zero to eight pixels, depending on its value.

However, much more memory is required. Displaying 640 horizontal by 250 vertical pixels ($640 \times 250 = 160,000$ pixels) requires $160,000/8 = 20,000$ bytes, or almost 20K of memory.

Compare this with the 2K for the character-based system. It uses much less memory but is less versatile and can display fewer distinct characters. Only crude block graphics are possible in the character-based, low-resolution system.

Because each system handles its display memory in a specific fashion, it is not usually possible to change the number of lines or characters per line without extensive hardware modifications.

In the October 1984 Ask Popular column, you mentioned that only 64K bytes of memory can be accessed by BASIC. Can you access additional memory (128K, for example) in other languages, and can some of that memory be specified as a RAM disk?

Mike L.
Dallas, TX

Sure. The 64K-byte limitation is set by the BASIC operating system and not by computer hardware. A program in assembly language, for example, could make use of virtually all available memory. Some of the integrated software packages require hundreds of K to load. One of these is Framework from Ashton-Tate (10150 West Jefferson Blvd., Culver City, CA 90230; (800) 437-4329). Many word processors also use all available memory to allow creation and editing of very long documents.

A RAM disk is simply a block of memory that has been set aside and designated as a disk drive. Since it is electronic, rather than mechanical, access is almost instantaneous. Sev-

Ask Popular is a monthly column conducted by contributing editors Harv Weiner and Steve Ciarcia to answer general questions about small computers. Send your questions to: Ask Popular, POB 397, Hancock, NH 03449.

eral pointers in the operating system are altered so that the computer sees this area as another disk drive, rather than free memory. The software to create a RAM disk is often supplied by manufacturers of memory expansion cards. Such manufacturers include:

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I have a PAL Commodore 1701 monitor and an NTSC Commodore 64 computer. I have video but no color on my monitor. Is there any way to make these units compatible?

**Thomas Richards
APO, NY**

Unfortunately, no. In 1953, the NTSC (National Television System Committee) established a method of encoding the color information on a video signal that was compatible with monochrome (black and white). It became the standard for all government-regulated broadcast television systems in the United States and a number of other countries. All U.S. television receivers and compatible computers (such as your Commodore 64) use this standard.

Two other standards for color encoding are the SECAM (Système Electronique Couleur Avec Mémoire) by Henri de France, and the PAL (Phase Alternation Line) by Telefunken. Used by most of the European, Asian, and African countries, these standards are not directly compatible with each other or NTSC.

Equipment for converting color encoding is available. Changing between SECAM and PAL is easy. The

signal is broken into its RGB (red-green-blue) components and re-assembled into the other format. Conversion between these signals and the NTSC signal is much more complex because the number of lines per frame must also be changed. Such systems have been built, but they are very expensive. It would be much cheaper to purchase an NTSC color monitor.

Our hospital laboratory acquired an Alpha-Micro computer from an instrument manufacturer. We would like to explore different applications but have no documentation for the AMOS/LI operating system. Could you supply an address for Alpha-Micro and perhaps tell us what programming languages are available?

**Jim Peters
Poway, CA**

AMOS is Alpha-Micro's exclusive operating system that includes features for multiuser, multitasking, and timesharing applications. Fortunately, it is compatible with all Alpha-Micro systems and will run BASIC, FORTRAN, and COBOL. Also available are a second-generation word-processing program, Alpha Write; a spreadsheet program, Alpha Calc, and hundreds more.

Contact Alpha-Micro, 17332 Von Karman, Irvine, CA 92714; (714) 957-8500, for additional information and documentation.

I thought that a compiler rewrites a computer program into machine language for faster execution, but my friend says I'm wrong. He says a compiler rewrites a program to the language for which the compiler is designed. Can you tell me who's right? Does an assembler do the same thing as a compiler?

**David Green
Denton, TX**

You're both right. To allow faster execution, a compiler translates a source program in a higher-level language into machine-language instructions (object code). The number of instructions generated is a function of the complexity of the high-level program. For example, a FORTRAN (FORmula TRANslation) compiler can translate complex alge-

braic equations into machine language. The programmer must only input the equations, and the compiler generates the mathematical operations needed to solve them. One statement in the high-level language may create a great number of machine-language instructions.

Assembly language is not considered a high-level language. Assembly-language statements, called mnemonics, have a direct, one-to-one correspondence to machine-language instructions and require the programmer to generate the detailed logic. An assembler program translates these source program mnemonics into machine language. (For more on assembly language, see the feature article on page 89 of this issue.)

A compiler or assembler program can run on any computer and produce machine-language instructions for any computer. A compiler or assembler that runs on one computer, but produces instructions for another, is called a cross-compiler or cross-assembler. This is the form of compiler that your friend mentioned.

Several devices are designed to operate electronic equipment without interruption from power loss or fluctuation. However, they seem expensive when the protected device is just a small home-control console or videocassette recorder. Is there a modestly priced backup system?

**Lynne Giottomini
Wedderburn, OR**

Yes. A simple battery pack, connected in parallel with a charger, makes an economical power supply. It supplies power during normal operation and recharges periodically. During a power failure it will continue to provide reliable operation for several hours or more, depending on the current drain. Because it's already on-line, a battery pack requires no expensive circuitry to switch from AC to emergency operation. Nickel-cadmium batteries work very well because they can be recharged hundreds of times. Many portable videocassette recorders include such a battery pack and recharger. □

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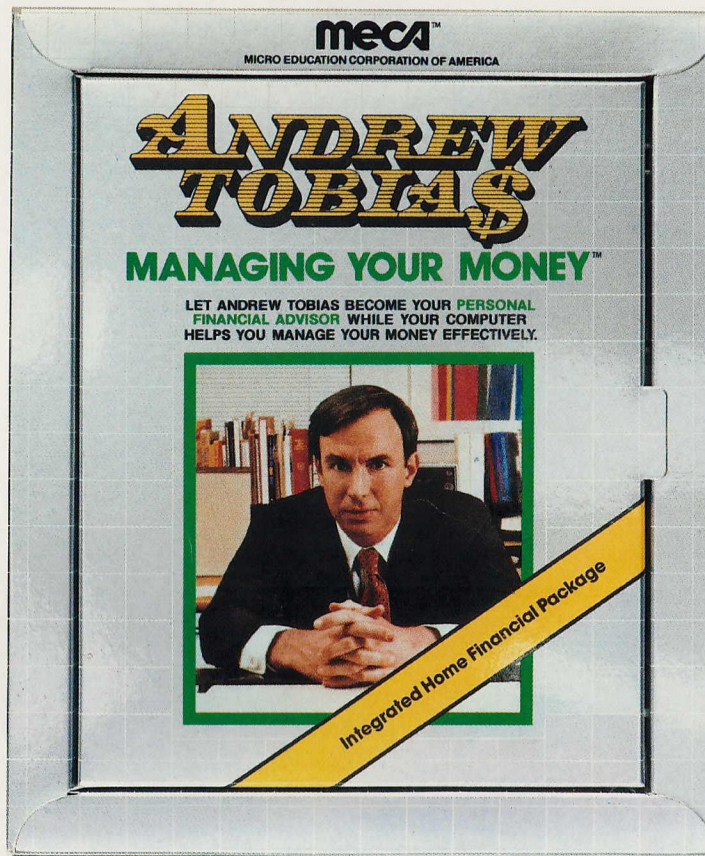
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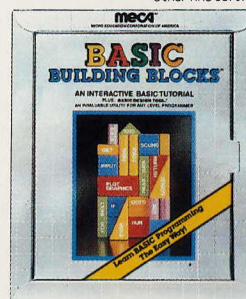
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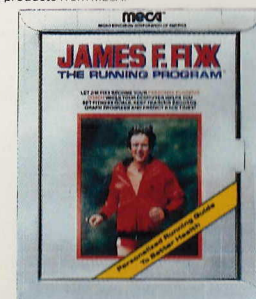
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